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VOL. XXXVII. DECEMBER, 1928. No. 4.

XC.

THE AMERICAN BOARD OF OTOLARYNGOLOGY.

[During the past four years, which comprise the life of the American Board of Otolaryngology, approximately fifteen hundred men have passed in review before it. The experiences of these four years, including thirteen examinations conducted in as many cities of this country and Canada, have developed many instructive facts relative to the men now in the active practice of otolaryngology and to the types of special training which they have received.

Six members of the Board, each especially conversant with a particular phase of the Board's activity, have here set down their observations as a constructive criticism of our present system of graduate training in Otolaryngology. These men have enjoyed a unique opportunity of surveying the status of the Specialty in this country and their conclusions should be of absorbing interest to everyone engaged in the teaching or the practice of it.]

HISTORY—PLAN OF OPERATION—PURPOSES.

BY W. P. WHERRY, M. D. (SECRETARY),

OMAHA.

A great movement may occasionally spring up spontaneously. Usually, however, many factors operate together in such a way that a definite plan finally becomes obvious—this sequence

has applied in the formation of the American Board of Otolaryngology.

In the years immediately preceding the world war, certain of the national medical societies, in attempting to limit their membership to otolaryngologists or ophthalmologists exclusively, found difficulty in living up to their desires. Realizing this predicament, a search was made for a logical solution. Experience gained during the early part of the war served as the basis for establishing a permanent remedy.

The American Academy, in 1916, at the convention in Memphis, appointed two committees, one a committee for ophthalmic examinations and the other a committee for otolaryngologic examinations. The object of these two bodies and their function was concerned with determining the character and ability of the candidates, that their election to fellowship would be recognized as an honor to the society and a standard of requirement thus established. The Committee for Otolaryngology was rather inactive for a few years, but during this period the Ophthalmologic Committee had been making splendid progress and had very definitely demonstrated the necessity of a national board, promoted and protected by all national societies.

At the New Orleans meeting of the American Medical Association, in April, 1920, Dr. J. C. Beck of Chicago, in the chairman's address read before the Section on Laryngology, Otology and Rhinology, offered the following:

"I desire to present a tentative plan for your consideration—a plan which is feasible and can be instituted immediately.

1. There should be organized a board of directors, selected from each of the five national otolaryngologic societies, namely, the American Otological Society; American Laryngological Association; American Laryngological, Rhinological and Otological Society; American Academy of Ophthalmology and Otolaryngology, and the Section on Laryngology, Otology and Rhinology of the American Medical Association.

Each society is to send five members, irrespective of having membership in one or more of the constituent societies.

2. This board of directors, having been selected somewhat in reference to geographic location, is to be divided into five

sections: (a) East; (b) Middle West; (c) North; (d) South, and (e) Extreme West.

3. The division into the five sections is made to facilitate the work of the board throughout the year, as the board as a whole meets only once a year, preferably at the annual session of the American Medical Association.

4. The board of directors should have absolute control of the development of the otolaryngologist, acting as advisory both to the institutions of learning or training, and to the student. It should, furthermore, determine the fitness of the applicant for training as well as practice.

5. A student having satisfied the board of directors of his fitness to become an otolaryngologist, and having shown that in his undergraduate studies, as well as during his internship, he has given especial attention to this branch, as, for instance, seminar work or theses, etc., he is referred to a clinician, who will train him for one year. This corresponds to the second year of internship in a hospital."

During the interval between 1916 and 1924, the Academy Otolaryngological Committee, having undergone many changes in personnel, and through the contribution of splendid work by Dr. J. C. Beck of Chicago, Dr. Ross H. Skillern of Philadelphia and Dr. Thomas E. Carmody of Denver, established a standard plan under which it could properly function.

During the year 1923, acknowledged leaders suggested the formation of a National Board for Otolaryngology, using the Academy committee as a nucleus.

The proposal was kindly received by five national societies—the American Laryngological Association, the American Otological Society, the American Laryngological, Rhinological and Otological Society, the American Academy of Ophthalmology and Otolaryngology, and the Section of Laryngology, Rhinology and Otology of the American Medical Association. Two representatives were selected by each of these societies, and at the invitation of Dr. George Shambaugh, one of the principal advocates for the movement, met in Chicago on November 10, 1924, and the American Board of Otolaryngology became a reality. The following organizations were represented:

American Laryngological Association:
Dr. Harris P. Mosher, Boston.
Dr. Ross Hall Skillern, Philadelphia.

American Otological Society:
Dr. Thomas Halstead, Syracuse.
Dr. H. W. Loeb, St. Louis.

American Laryngological, Rhinological and Otological Society:
Dr. Burt R. Shurly, Detroit.
Dr. Frank Spencer, Boulder.

American Academy of Ophthalmology and Otolaryngology:
Dr. Thomas E. Carmody, Denver.
Dr. W. P. Wherry, Omaha.

American Medical Association (Section on Laryngology, Otology and Rhinology):
Dr. J. C. Beck, Chicago.
Dr. R. C. Lynch, New Orleans.

Officers elected were:
Dr. Harris P. Mosher, President.
Dr. Frank R. Spencer, Vice-President.
Dr. H. W. Loeb, Secretary and Treasurer.

In 1927, Dr. Spencer very graciously withdrew to allow the appointment of a member from the Pacific Coast, and Dr. Ralph Fenton was appointed to represent the Far West.

In July, 1927, Dr. Loeb died. The American Board felt keenly the death of Dr. Loeb. Most of the later procedures followed by the board were conceived through his genius in organization and by the breadth of his judgment. Dr. Lee Wallace Dean, now of St. Louis, was appointed to succeed Dr. Loeb. Following Dr. Loeb's death, Dr. W. P. Wherry of Omaha was elected to the position of secretary and treasurer.

In 1928, Dr. Halstead, on account of illness, resigned and Dr. Thomas J. Harris of New York was appointed.

Dr. Frank Spencer, Dr. Leroy Schall, Dr. Arthur Proetz and Dr. Perry Goldsmith have been requested at various times to assist the board, and appreciation is here expressed for the services rendered.

Under the able leadership of Dr. Mosher, the organizing genius of Dr. Loeb, the careful planning of Dr. Skillern as chairman of the Subcommittee on Examinations, plus the splendid cooperation of each member of the board, procedures were planned which established the functions of the board.

Immediately after organization, invitations were sent to acceptable members of national societies to apply for certificates without examination. Since then the following examinations have been held:

	Total Examined	Passed	Failed	Formal	Certified
Certified by Invitation	.....	.....	.....	.....	354
Philadelphia	184	121	20	43	164
Chicago	147	99	22	26	125
Dallas	68	45	8	15	60
San Francisco	54	40	1	13	53
Denver	33	25	1	7	32
Montreal	54	36	3	15	51
Washington	142	94	24	24	118
Spokane	52	30	6	16	46
Detroit	97	74	6	17	91
Memphis	53	39	6	8	47
Minneapolis	49	35	3	11	46
New York	130	83	17	30	113
St. Louis	79	56	11	12	68
	1142	777	128	237	1368

Percentage of failures: 14.1%.

As soon as the work of the board had progressed to the degree that its place was eminently established, the Pacific Coast Oto-ophthalmological Society passed a resolution making the possession of either the ophthalmic or otolaryngologic certificate a requisite for membership.

Many local societies throughout the country now demand that their candidates be certified by one of these boards before they are eligible for membership.

PRESENT PLAN OF OPERATION.

Every candidate for a certificate is asked carefully to fill out an application which sets forth his medical education, his preparation for the specialty, various locations of practice, society memberships, teaching activities and literary contributions.

Upon receipt of this application in the secretary's office, the information specified is corroborated. Six confidential letters are sent to references—two of whom are specified by the applicant and four selected by the secretary unknown to the applicant. All recommendors are asked for an expression concerning the applicant's integrity, his standing in the community and ability as recognized by his confreres. The biographical department of the American Medical Association also furnishes a report on each candidate from the data in its files. Occasionally leads are given in the confidential replies and these are investigated. No doubt many who read this report have from time to time been petitioned to furnish information. It is the earnest desire of the board to secure unbiased and authentic data, and we earnestly solicit the sincere cooperation of those addressed in making reply to such communications.

With this preliminary information, the board sits as a committee on credentials the evening prior to the scheduled examination. Every candidate to appear is carefully considered and personal prejudices are evaluated.

Applicants are divided into three classes:

1. Those recommended to receive the certificate without examination.

2. Those to be given a partial examination.

3. Those for whom a complete examination is deemed advisable.

The opinion of one member of the board is not accepted as sufficient to classify an applicant—this important conclusion must be the decision of the complete body.

For obvious reasons, the board feels that each applicant must present himself to the entire board at a formal session before a certificate is granted, regardless of how he may be classified.

Certain well known otolaryngologists of unquestionable ability have been invited to sit with the board on various occasions in order that the board may receive constructive criticism. This cooperation has proven very helpful, and the board here expresses its appreciation for the services thus rendered.

The actual examination is conducted under the following divisions:

Executive—Dr. W. P. Wherry.

Preparation, Personality, Confirmation of Credentials.—Dr. Ross Hall Skillern.

Each applicant first reports to Dr. Skillern, who, having the credentials before him, is able to check the accuracy of the information and form conclusions regarding the applicant's preparation, personality and general efficiency.

Didactic.—Dr. Harris P. Mosher, Dr. Burt R. Shurly, Dr. Lee Wallace Dean, Dr. Thomas J. Harris. Collaborators: Dr. Frank Spencer, Dr. Arthur Proetz.

Each applicant taking the regular examination sees two didactic examiners, who are expected to satisfy themselves that the candidate in question fulfills the requirements in fundamental knowledge of our specialty to a degree that has been termed "a minimum standard of safety."

Experience on the part of the examiner is desirable, for his personal contact with applicants increases his ability to so construct questions that specific information is brought out. It also improves the value of his opinion concerning the candidate's professional judgment and his power to analyze given problems.

This manner of interrogating a candidate differs radically from the usual undergraduate star chamber examination, where most questions asked are to procure technical information. In our plan the board is interested in the fundamental knowledge of the applicant, his breadth of judgment, his line of reasoning and his ability to put his knowledge into practice.

An experienced examiner can sometimes arrive at his conclusions regarding a candidate's fitness in a few moments, but in justice to a doubtful candidate, thirty minutes or more may be taken.

Vague questions are not presented to reveal knowledge of facts only, but also to determine, in an indirect way, the candidate's reading and his knowledge of the literature.

Clinical—Dr. Robert Lynch, Dr. Thomas Carmody, Dr. Ralph Fenton.

Each candidate is expected to see one or two of the clinical examiners. Here a patient is assigned to the applicant.

His method of approaching the case, conception of possible correlated clinical facts, accuracy, general diagnostic ability and therapeutic knowledge are determined by his response to the questions of his examiner.

Pathology.—Dr. Joseph C. Beck. Collaborator: Dr. Leroy A. Schall.

Applicants in Class III (one to seven years in special practice) are expected to take this subject unless a special ruling to the contrary is made by the credentials committee.

Since the board has been somewhat disappointed in the average showing of the knowledge of pathology by applicants, it seems advisable to have Dr. Beck express the opinion of the board—this he will do in his part of the brochure.

Applicants in Class II (seven to fifteen years) are expected to present twenty-five case histories. The cases reported are to be of varied character and should portray the candidate's ability in making accurate diagnosis. The information thus recorded will assist the board in ascertaining the applicant's qualifications.

After the examination the entire board sits as an examination committee. As an applicant's name is read, each examiner reports the grade rendered by him. Discrepancies in the marks of the various examiners are given especial consideration at the end of the session. It is an interesting fact that in more than 85 per cent of persons examined, each of the five or six examiners, before whom the applicant has appeared, will have the identical grade recorded.

At the conclusion of the session, each case on which the opinion of the board was not unanimous is carefully reconsidered. Each examiner must explain the questions asked and the answers given. The entire board determines the ultimate result. It has been found that this method prohibits the possibility of an examiner confining his investigations to a single subject, or perhaps "riding a hobby," in the vernacular of the medical student.

No applicant is failed without a most careful consideration of his credentials and a thorough review of his examination report. When doubt exists in the mind of the board regarding

the fairness of the original examination, the applicant is given an opportunity to again appear.

The board has been approached from time to time to examine postgraduate students, immediately after their term of service had expired, with the understanding the certificate was to be withheld for one year.

Experience has shown the students passed the examination very creditably but comparing such candidate's marks with those applicants coming from the same institution after having been in actual practice for one year, the result has not been so satisfactory.

The board feels consequently that the student should not come up for examination until a year had elapsed after his period of training, thus permitting the board to determine what basic information has been retained.

The board is now contemplating altering the present plan of examination to meet this situation.

The board issues a directory every second or third year, listing the names of those to whom certificates have been issued, stating their qualifications and giving other pertinent information. These directories are available for anyone desiring a copy at a minimum cost.

The board feels a present need for constructive effort to standardize the qualifications of an otolaryngologist. Many teaching institutions specify in their catalogues that graduate instruction is given, but in reality only residencies or internships are available, and the student is left to gather, on his own initiative, desirable information, operative and clinical, with essentially no fundamental instruction. The pathologic training so necessary for the younger men is particularly lacking in these institutions. A survey has been deemed necessary on account of the many inquiries relative to postgraduate preparation, and the result of this investigation is now being prepared and will be issued in a pamphlet.

THE FURTHER AIM OF THE BOARD.

Every organization and every activity should have a definite purpose as the basis for its existence. In this connection, the American Board of Otolaryngology was primarily conceived

as a means of protection to the various national societies. As the work of the board progressed, new purposes developed, not the least of which was to standardize the qualifications of the otolaryngologist. Up to this time the name was used to represent the medical practitioner who chose to appropriate the title, personal qualifications and merits being assumed. The board feels it is now time to insist that the otolaryngologist demonstrate his ability, knowledge of his subject and fitness to practice to an impartial jury, with whom should rest the final decision. To be received as an otolaryngologist and to be recognized as such by his associates, the claimant should have the approval of this jury. The board, through its experience and knowledge of the situation, believes it can creditably serve in such capacity.

Membership on teaching staffs, on hospital staffs, in industrial organizations, society affiliations and all other places where otolaryngology as a specialty is to be recognized, should carry with it the possession of this approval by the board. No one small group of workers can possibly accomplish the above purpose, but if each of the fourteen hundred certified otolaryngologists cooperates and insists that the particular college, hospital or society in which he is interested, accepts only applicants for positions who hold a certificate, the movement will not only progress as an organization but the elevation of the field of otolaryngology will become a reality.

Signs of advancement in otolaryngology are apparent to the board through the study of those who failed to qualify for certificates and later appeared for reexamination. In almost every instance the candidate has, in the interval, engaged in study and postgraduate work, is greatly appreciative of the stimulus supplied by the board and has made of himself an otolaryngologist. The fact remains, however, that prior to his failure his own word of fitness had to be accepted by his confreres and the public as well. The appreciation of the purpose of the board by the candidate who failed, together with his apparent improvement, has been one of the outstanding facts that makes the sacrifice of time a compensation to the individual members composing the American Board of Otolaryngology.

As a summary and in conclusion, the board feels its work has been well planned and is perfected to such a degree that

the movement can grow under this system of standardization, also the ranks of this specialty will be composed of certified members and through this field work the term "otolaryngologist" will have a real meaning, a valuation, will demand respect and give the specialty a major rather than a minor rating in the domain of medicine.

EXPERIENCES AND CONCLUSIONS IN THE FIELD OF PREPARATION FOR THE SPECIALTY.

By Ross Hall Skillern, M. D.,

Philadelphia.

Some years ago, when the board was first organized, at one of the early meetings, an application blank was drawn up and carefully formulated by the full body, so that on reading over the answered questions one would be in immediate possession of the true and intimate qualifications of the candidate. The questions entered into some detail, embracing everything from the premedical education through general medicine and internship and the different phases of the specialty up to the time the candidate presented himself for examination.

It was thought that when the board held its preliminary meeting the night before the examination that this would be an infallible index to the scientific attainments and general qualification of the candidate. On this basis it would be possible to approximately rate him as to the character of the examination that he might be expected to present. This was given a trial, but after the first examination the final analyses of these ratings were so divergent that it was thought advantageous to appoint a special member to interview the candidates and check up on their statements of special preparation immediately before their appearance before the special examiners in the scientific and practical subjects.

This special member would also mark their cards so that the other examiners, by comparing their own marks, could note at a glance to just what extent the candidate had measured up to his contentions. This procedure at once bore fruit, giving the examiners an immediate insight as to qualifications of the candidate, as well as the kind of examination which, in all fair-

ness, should be conducted. Subsequent examinations, however, showed that while in the main the special member's estimation of the candidate's fitness coincided with the other examiners, nevertheless, in certain cases there was a wide divergence in the marks. It was at first difficult to reconcile these differences, but as time went on the solution became more apparent.

In the first place, the special examiner did not always inquire into different phases with each candidate, but rather considered all in one category—in other words, judging them all by one set ideal standard. The candidate should have had a given internship, a given graduate course or courses, a given assistantship, etc. The fallacy of these postulates gradually became apparent. One man may have had splendid special training, yet be distinctly lacking in the practical applications; another may have had comparatively meager preparation, yet be distinctly safe and sound in all his principles and practice.

The fault was that the personal equation had been entirely overlooked. In the first instance, while the candidate's training was all to be desired, nevertheless, he had buried his talent and had made no progress, while in the second instance the other candidate had improved himself by close observation, intensive study and taking advantage, not only of his own experiences but the experiences of others as well, so that he had developed into a man of skill and trustworthy judgment.

It was at once apparent that a certain standard could not be set to fit every candidate. For example, it was manifestly unfair to rate a man who had been practicing the specialty for, we shall say, ten years with one who had but recently taken a special course at one of our universities and expect them both to show like training. On this account a radical departure was made from the method hitherto used. Instead of trying to ascertain whether a man had done certain standard things, inquiry was made as to what possible work he had done to fit himself for his specialty. For example, the younger man had taken a special course of two semesters at a university which had fitted itself to give this work, while the man who had been out ten years could not have done so had he desired, for at that time such courses were not in existence. He, however, could have and probably did avail himself of such faculties for special work as prevailed at that time. Under these circum-

stances, why should he not receive as much credit as the former, even though he had not even approached him in the actual number of academic hours spent in preparation for his specialty?

Taking these things into consideration, candidates were divided into five classes: First, those that had been in special practice one to three years; second, three to six years; third, five to ten years; fourth, ten to twenty years; fifth, over twenty years.

Ratings were given not only for the character of personal preparation but for time spent, opportunities grasped, positions acquired, original research, writings, war service, society activities and personality. In each case the sum total of these ratings amounted to 100 per cent. The individual ratings, however, were different (sometimes widely) in the various classes. For example, one would expect a man in the third class, who had been practicing between five and ten years, to have acquired a certain standing in his community, embracing a position of importance in the local hospital, while with a young man out two or three years this could hardly be expected. Therefore, they could not be rated alike in this instance. The same would hold good for original research, writings, etc.

Again in special societies a young man could hardly be expected to have joined so recently, while the older one would certainly have been expected to associate himself with one, had it been available in his locality. In order to meet with these requirements, a table was drawn up giving a special rating for each preparatory or academic unit in each class, grading them so that in every case the total equaled 100 per cent. Using this table as a basis, it was possible to ask each candidate the same questions, credit being given not along a given standard but entirely as to an average standard for the class to which he belonged.

Thus, a man out within the past five years, may have taken a special internship in otolaryngology, while an older man, having been denied such an opportunity, had made a special pilgrimage to a city, as Vienna or London, and had spent six worth-while, intensive months at these places. Under these circumstances, it is only fair to give these men similar credit, as while both had the same object in view, nevertheless, force

of circumstances compelled one of them to accomplish it in the only manner available at that particular time.

Now a word regarding the American system of training in otolaryngology. Despite the fact that many colleges and universities state in their catalogues that they are prepared to give comprehensive courses of two semesters or more in graduate otolaryngology, nevertheless, when prospective candidates present themselves they often find that these courses exist largely on paper, and little has been done to bring them into actual academic being. Under these circumstances, even though the course be actually given, it must of necessity be but poorly organized and more or less in the nature of an extemporaneous affair to carry out the provisions of the catalogue. Men who are unfortunate enough to choose these courses find themselves, at the end, while perhaps well grounded in certain subjects, sadly lacking in others, which militates absolutely against the possibility of having received a well rounded course.

Special internships (unless the fundamentals, anatomy, physiology, the pathologies, etc., are thoroughly presented) also leave much to be desired, for while the ground may be well covered in the clinical and perhaps laboratory sides, nevertheless, the academic branches are presented in only a haphazard sort of way so that the student, on leaving, lacks the solid foundation so necessary for the practice of the specialty.

Postgraduate specializing work with one man, unless he is connected with a medical college in which all subject branches are available, is also apt to be one sided, either toward the ear or the nose and throat. It has been the experience of the board that these men are usually well versed in one side but decidedly deficient in the other.

The solution of this difficulty lies with our medical colleges. One of the most prominent in each section of the country should institute graduate courses (similar to the University of Pennsylvania) and conduct them with the same enthusiasm and thoroughness as they do their undergraduate ones. The other colleges should discontinue any pretense of such courses and frankly declare that this is special work out of their province. In this way we would have four or at the most five colleges which would teach graduate otolaryngology. It would

take but a short time to give these schools their proper rating and, with the criticism and cooperation of the board, all should soon be fairly alike in the principles and practice of teaching as well as purposes and ideals.

As these things have become generally known, it is gratifying to note the cooperation that the board is now receiving from those appearing at the examinations. In the early days many of the men assumed an impatient, defensive attitude, as though, while desiring to receive a certificate, they were appearing against their will, and any question other than purely formal was more or less of an insinuation against their knowledge of the subject. Indeed, in rare instances point blank refusals to answer were given. Now all this has changed; everyone recognizes there is nothing personal in the examination, and instead of covert enmity, only the spirit of fellowship and cooperation is observed and carried out, from the first to the last man on both sides, and finally let me reiterate the purpose of the board is not to find out what a man does not know but rather to learn his practices, ideals and purposes as well as his special knowledge and fitness, and then to judge whether he is to be nationally recognized as a safe and sane man to practice the specialty of otolaryngology in his community.

THE DIDACTIC EXAMINATION.

By Harris P. Mosher, M. D.,

Boston.

The didactic examination is divided sharply, according to the grading of the applicant. If he has just finished his preparation and been but a short time in practice he is examined chiefly on the fundamentals of the specialty. My assignment with such an applicant is to examine him in anatomy.

I have no trick questions. The same ones are asked over and over again. Anatomy, if correct, is always the same. When a man poses as a specialist and makes the major part of his living operating on the nasal septum, the maxillary antrum and the tonsils, he should know something of the nerve and blood supply of the septum and something of its anatomic divisions; he should know how often the antrum is anatomically absent,

what teeth are in constant relationship with it, where the ostium is and something about the nasal wall. In regard to the tonsil, he should know the main blood supply, what artery to tie as a last resort to control tonsillar bleeding and have some idea where to find it. If he knows the nerve supply of the tonsil, I am grateful. If he knows the composition of the posterior pillar, I am not only grateful but surprised. I ask the more difficult questions—often dubbed "catch questions"—only when a cocky know-it-all appears, but seldom count the answer except it happens to be right. A candidate is seldom rejected on anatomy alone. His average for all subjects has to be below passing to fail him.

Applicants who fall into the second and third groups are examined chiefly on their judgment and experience. The board feels that its mission is both to protect and in time to raise the standard of the specialty and to safeguard the public. The vital point to be settled is whether or not the candidate is a safe practitioner of the specialty. There is, of course, a standard below which no candidate can fall. For instance, one —and there have been more than a few—who does not know that hoarseness is the earliest and most outstanding symptom of cancer of the larynx, is neither a qualified specialist nor a qualified physician. There are a few fundamental facts like the one just given, ignorance of which at once disqualifies.

In examining candidates of the second and third groups the examiner tries to get a fair cross section of the man's experience, to grade his judgment and to learn his reaction to the surgical emergencies of the specialty.

The men in the third group are asked no anatomy. Not that the older men should not know anatomy, but they seem to have long so arranged their activities as to use little or none.

In some communities the amount of special knowledge required to make a man an otolaryngologist in the eyes of his brother physicians and before the community is pitifully small. The number of specialists who have never done a radical mastoid, tied the internal jugular vein or explored for a brain abscess is astonishingly large.

In attempting to get a line on a candidate's judgment I often ask "what operation do you dread and why?" Only twice has

the answer been "None." Needless to say, both candidates who gave it were young. Another favorite question of mine is—I am now giving away trade secrets, but that does not matter—"What operation did you do last, and why?" This makes the beginning of the examination less formal, but it soon leads to valuable information.

The best examinations from the textbook standpoint are passed by the younger men, lately graduated from school or special hospital, and men from the better schools conspicuously outrank other candidates. Now and then a man from nowhere ranks high but not often. Candidates trained abroad have not put the candidate trained at home to shame.

In asking questions on anatomy I have found less knowledge of the larynx than of any other anatomic structure. Why, I do not know. The clinical examiners have found the same thing. In some examinations it seemed as if the larynx had dropped out of the specialty.

The candidate who excites my greatest admiration and my fullest sympathy is the one who comes up for reexamination. Generally he is a man along in years. Usually he has paid a stiff railroad fare to get to the place of examination. Often he is a small-town man. Climate, circumstance and locality have made his fare in the specialty humble and meager. Yet he is sincere—otherwise he would not have gone to the trouble and expense to take the examination, to say nothing of taking it twice. I will pass any such man if I possibly can. So will all the other examiners. Usually such men do pass the second examination, not because of the charity of the examiners, but because they have learned what the examination calls for and have returned home and prepared for it.

THE CLINICAL EXAMINATION.

By R. C. Lynch, M. D.,

New Orleans.

Is the candidate fit to practice otolaryngology safely? This is the question I must answer for myself first, and then as one of ten who must collectively answer for the candidate. If you will meditate for a while, I am sure you will see the Board of Examiners has no easy task, for we take it seriously. Our

candidate is a man of our profession, our colleague, for whom we have regard, respect and a most kindly feeling. We are obligated, not only to the people with whom he may have contact as patients but to hospital organizations, local medical societies, national medical societies and the public as well; to each we must deal fairly without prejudice but, above all, with justice to both.

The clinical examiner comes into close contact with his candidate, since he sees him at work with the implements of his profession, and upon a patient for whom he must make a diagnosis and discuss those methods of treatment which will, in his estimation, bring back health and well being.

From the start I have felt that my own opinion as to methods of treatment, including operative procedures, must be held in the background, for the candidate has also the right to his opinion, and if this is backed by sound reasoning, good judgment and a knowledge of tissue reaction and repair, I accept his experience. If, however, this should vary radically from accepted facts, there is opened a field for argument, and this we do until I am satisfied not only that he is fit but safe as well.

"Good morning, doctor, have you your mirror and glasses (if you use them)?" A positive answer indicates preparation and carefulness; a negative answer without a good excuse at once puts me on my guard. The patient has been examined by me previously and I am acquainted with the history as furnished by the clinic where the examination is being held, and I have instructed the patient not to venture any information but to answer all questions truthfully and freely. The candidate is then shown the set up—told they are clean and asked to examine the patient just as he would do at home. There are tuning forks, transilluminator, a turning chair at hand, and then I watch his procedure closely, though he may not always know it.

It had been said that in medicine cleanliness comes before godliness, and with a few reservations this is true—yet only 20 per cent of the candidates wash their hands before beginning examination. We have had the experience where candidates actually refused to observe this detail under such cir-

cumstances. One's imagination might carry him far in wondering what happens to those unfortunates who must unknowingly submit to such possibilities of infection. Details of this type make a firm impression on us naturally, and we are usually not mistaken when the collective estimation of this candidate is brought forward.

The candidates at once divide themselves into two general classes, which are of increasing interest as they throw light on apparently two widely different methods of instruction, namely, those who take a very carefully detailed history, which names and describes all of the anatomic points and pathologic deviations in the ear, nose and throat, but with no apparent fixed idea as to the condition for which the patient seeks relief. So many times have I listened at length to: The external appendage of the ear is well formed and shows no abnormality, the canal is open and shows small amount of wax on its walls, the membrana tympani is of normal color and tone, the light reflex normally placed, there are no scars on the drum, the malleus handle is not foreshortened, the short process of the incus is visible, the mastoid is not tender, the eustachian tube is patulous—and when I ask, "Well, why is the patient deaf?" there is consternation and confusion, and sometimes even "I don't know." Likewise I am told the Weber lateralizes to the right ear—the Rinne is negative, Schwabach is long—and when I ask what this means there is, now and then, almost a blank stare. In other words, the observation is made as if on an anatomic specimen or according to some stereotyped chart for examination with utter disregard as to what all of these observations mean and what bearing they have upon finding out just why the patient is deaf. I am firmly convinced after these years of experience that the taking of a history with no aim in view is one of the faults of teaching methods.

In the handling of tuning forks, the instances are relatively few where the candidates seem to have any knowledge of the physics of the forks or of sound and its transmission, as evidenced by the way the fork is struck, its approach to the ear, and in a Rinne test the carelessness of its application to the mastoid and the relation of the stem to the external appendage. Some or many of them never use forks for testing the hearing, a watch and whispered voice or spoken voice being the only

implements. Are these men fit? Are they safe? Please answer. The second class, and many of these are the older men, ask leading questions directed to the cause of deafness, and it is sometimes astonishing how much information is gained in what seems so little time. Here the history is directed to the cause of the deafness, and but few questions are necessary to make the differential diagnosis. These candidates seem to have well in hand not only the mechanics but the pathology as well.

The teaching method which produces the latter student develops the keenest observer, the better diagnostician and usually the treatment outlined is on a firmer basis. He is both fit and safe.

You would be surprised how many men do not seem able to see a drum at all. Given a case of chronic suppurative otitis media with complete destruction of the drum, including the handle of the malleus, with but little secretion in the canal, and two out of five, usually of class III men, will say the drum is red and bulging or retracted. When asked if there is a perforation, they say "No." Then where does the discharge come from and we are stumped. It will take from two to four trips back to the patient to finally settle the diagnosis. Are they fit? and safe? Please don't decide on this alone. I wouldn't, but so many times I must ask help from either Dr. Carmody or Dr. Fenton to decide when instances like this arise, and we make it a rule, when we are not sure individually, then we too must have help from our colleague in the work—this is both fair and just.

The use of the laryngeal mirror is another source of surprise. Many otolaryngologists who have been candidates are woefully lacking not only in the use of the mirror but seem to have no coordination between what they see and the whys thereof. I have the impression, and I am not lonesome in this observation, that at least the majority of the younger men either pay no attention to laryngology or at least have the most meager information. Their knowledge of the musculature of the larynx and its function was a shock. When asked to draw a picture of a recurrent paralysis, one would think a tiny child had marked upon the paper. Surely, to say the least, such preparation is not well rounded. As for the reasons for the various treatments outlined, so few have any idea of the patho-

logic state of an inflammatory process and the materia medica for its relief. What is the action of weak solutions of silver nitrate on the mucous membrane of the nose? What is the action and why use tincture of benzoin in hot water as a tracheal inhalant? There is no trick here, and yet few seem to know why. In the treatment outlined for sinuses, two procedures are almost universal—one is suction, the other argyrol tampons. Both have, to my mind, one characteristic—they are very easy to apply—and are impressive. It would surprise you how few have stopped or taken time to think why either has any value. What is the physiologic action of iodide of potash in small doses on mucous membranes?—can you answer? In other words, we have the idea that materia medica is a sadly neglected subject in the preparation of the present day.

We have also been most forcibly impressed by the apparent lack of the relation of general medicine to otolaryngology. Even the group who take a painstaking history rarely ask about general physical findings. May I mention, for instance, blood pressure, pulse rate, chest phenomena. Intestinal habits, endocrin relations or kidney function are rarely inquired into, and as for teeth, evidently few patients have such things, judging from the observations. Many of our candidates are quite alive to all of the above, of course, and yet when they make no mention of the fact we must use some means in a quiz to settle the same. I am convinced that many of our younger men have so concentrated in their training they seem to forget these general relations.

We recognize that one's acquaintance with the history of otolaryngology and its men of mark, as well as the knowledge of standard books and periodicals, is another evidence of a well-rounded education. You can imagine our surprise when the candidate is wholly at sea when quizzed along these lines.

One more point: Should the candidate read his own X-ray plates? Many do not. You examine the patient, why not the plate? Has he been taught, or taught himself? Is he fit? Is he safe? Would you judge him on this alone? Most certainly not. Here again is a link that we have found is weak.

The clinical examiner must be alive to every little detail; he sees much that is startling and likewise much to admire. He

is in close contact with the most active phase of the examination, and he must put aside his own fancies, that he may pass unbiased upon the fitness and safety of his colleague. It is no easy task, and when the day's work is done he, at least, knows it.

EXPERIENCES, CONCLUSIONS AND GENERAL INFORMATION DERIVED FROM THE EXAMINATION IN PATHOLOGY.

By Joseph C. Beck, M. D.,
Chicago.

There are three facts that I desire to set forth as introductory to this article which will immediately establish in the mind of the reader a belief of the timeliness of this subject: (1) Fundamentally the knowledge of pathology is of prime importance in clarifying and rationalizing the etiology, symptomatology, diagnosis, prognosis, course and treatment of all diseases, not excepting those of the ear, nose and throat. (2) Although the material for study of pathology has for a long time been present in profusion in the practice of otolaryngologists, there has been, up to very recently, less work done in this specialty than in any other branch of medicine. Particularly is this true in the United States. (3) During my twenty-five years or more of experience in teaching otolaryngology to postgraduate students, coming into contact with specialists from smaller communities at various national and local societies, later in examining otolaryngologists for admission to membership in the American Academy of Ophthalmology and Otolaryngolgy, and more recently as a member of the American Board of Otolaryngology, I have found a woeful lack of knowledge of the pathologic changes that are present in the more common as well as in the rarer diseases of the nose, throat and ear.

With these three facts in mind, permit me to elaborate on what I feel is necessary for the younger generation to do in connection with their training in this specialty. First, the young otolaryngologist must possess the knowledge of the fundamentals of general pathology, both gross and microscopic. Although he may never be compelled to do the technical work of preparing the specimens, it is well to have this information. He must be well acquainted with the use of the microscope

and have the very best knowledge of tissues and cellular elements. He should possess a collection of well prepared specimens of the commoner conditions of the nose, throat and ear, removed at operation, which will serve as standards and be of particular value, especially if one knows the history of the patient. These specimens should be studied under the supervision of the teacher. The more common conditions and structures include:

1. Inferior turbinate.
2. Septum.
3. Middle turbinate.
4. Bony and membranous portions of the maxillary, frontal and sphenoid sinus as well as the ethmoid.
5. Membranes of the sinuses only.
6. Bone, only, in all of the above.
7. Nasal polypi.
8. Neoplasms (sarcoma, carcinoma and other types).
9. Tonsils (children and adults).
10. Adenoids.
11. Neoplasms in naso- and oro-pharynx (sarcoma, carcinoma and other types).
12. Remnants of tonsils and adenoids.
13. Recurrent tonsils and adenoids.
14. Chronic lateral hypertrophy of the pharynx.
15. Lingual tonsil.
16. Compensatory lymphoid tissue of the pharynx and the base of the tongue.
17. Larynx biopsies and both tissues removed at operation.
18. Ear polypi and other neoplasms; granulations and cholesteatomatous masses from the middle ear.
19. Mastoid chips.
20. Lateral sinus wall, with or without thrombus.
21. Meningeal tissue removed at operation.
22. Brain abscess wall.
23. Brain tumors, especially auditory nerve tumors.
24. Brain tissue of a cerebral or cerebellar hernia. The conditions just enumerated should contain both acute and chronic states wherever possible.

Following postmortems much more extensive examinations can be made, since more material is available. This is of par-

ticular importance, since the American Medical Association and the American College of Surgeons have put a premium on postmortem examinations in standardized and accepted hospitals. The results of this propaganda are already seen in more ways than one: medical schools have more fresh pathologic material; hospital conferences are much better attended, since pathologists' reports accompany the proof of cause of death, and the attending men in such cases feel impelled to be present to defend their course of action in the event that it is questioned.

In our larger public institutions, for example, the Cook County Hospital, conferences in pathology, directed by a very competent, full-time pathologist, are regularly held, and these are attended not only by the greater portion of the hospital staff but by many men and women from other institutions. Such activities give great hope that at some future time this country will have facilities for teaching pathology equal to that of any foreign country. It would be well if an otolaryngologist qualified to prepare sections were present at the postmortem of any case wherein symptoms relative to the ear, nose or throat existed, since the average pathologist is not thoroughly familiar with the finer points involved. Research and animal experimentation relative to pathologic changes will further aid in securing this knowledge.

I have said very little relative to bacteriology, hematology, allergy, serology and the study of other body fluids, all of which are very important in the summation of a pathologic picture.

Returning to my experience as examiner of pathology on the American Board of Otolaryngology, the men who come up for examination invariably state, even before a question is put to them, that they refer their work on pathology to a competent man in that line and depend on his diagnosis. That, of course, is a proper procedure insofar as it concerns the examination of tissues for malignancy, tuberculosis and other neoplasms. It has, however, nothing to do with having a thorough knowledge of the gross and microscopic changes that take place in the mucous membrane or bone of the turbinates, sinuses, tonsils, adenoids, middle ear, mastoid, labyrinth or intracranial struct-

ures. The clinician is far more competent to judge a gross or microscopic change than the pathologist, because he is in possession of the history, clinical findings, etc., which are a great aid to him, and he should know what these changes are. The best course to pursue is a combined study by both the pathologist and otolaryngologist. The same may be said of the reading of X-ray plates from the pathologic viewpoint. Many an error could be averted if the clinician were able to interpret an X-ray film or a microscopic section. I have found great satisfaction in combined effort with my radiologist and pathologist as well as other men in their respective specialties, whenever a case is of borderline character.

This brings me to the discussion of borderline subjects of otolaryngology. I have been afforded the greatest satisfaction in the study and treatment of some of these conditions, and it is my belief and fervent hope that the otolaryngologists of the younger generation will be so proficient in the management of these diseases that they will merit the recognition of the medical profession and the laity as experts in this field. Some of the most interesting problems in pathologic study present themselves in these borderline cases, and as a result of this study the otolaryngologist's experience is broadened and his practice much enriched. There is no reason to consider this as overstepping the bounds or limitations of an otolaryngologist's practice. Some of the more frequent borderline subjects are: (1) thyroid enlargements; (2) glands and tumors of the neck; (3) tumors and cysts about the upper and lower jaw; (4) congenital and acquired deformities about the head and neck requiring plastic surgery; (5) tumors, cysts, stones and abscesses of the salivary apparatus and floor of the mouth; (6) intracranial conditions other than sinus thrombosis, brain abscess and meningitis, such as tumors of the pituitary gland, pontile, cerebellar and eighth nerve tumors, and cerebral and cerebellar hernia; also Gasserian ganglion affections. There are many others, but this enumeration will suffice to show what is meant by borderline conditions. These patients, by nature of their symptoms, will consult an otolaryngologist, and the structures involved are within the limitations of his routine examination. A collection of both gross and microscopic specimens of the above mentioned structures and conditions is most desirable.

And now comes the most important as well as the most difficult question to answer in connection with this subject, namely, "Where shall a man go to obtain such knowledge as outlined above?" As previously stated, he must have the fundamental knowledge of general pathology, and that he has surely received in the institution from which he graduated. Special pathology is being given in several institutions in this country, although the number is far too limited to suffice. As graduate teaching is being urged more and more in our universities, there will be a greater number of special pathologists trained for teaching, especially since more postmortem material is obtainable. It is hoped that the realization of this ideal state may be brought about in the near future, so that men desiring a knowledge of pathology need not look exclusively to the great institutions abroad for this type of learning.

CASE HISTORIES.

By Ralph A. Fenton, M. D.,

Portland, Oregon.

Requirements of hospital standardization have acquainted all recent interns with the voluminous forms necessary for complete case records; and it is not therefore surprising to find a very gratifying compliance with such practice among many of the younger otolaryngologists. However, even the best trained man who has become accustomed to keep rather fragmentary office records, consisting largely of diagnosis, treatment and record of payments, is not at ease when requested to submit case reports to the Otolaryngology Board. He may err from habit on the side of abbreviation, or he may be guilty of the sin of padding out a record manifestly incomplete.

The case record, so far as the Otolaryngology Board is concerned, should demonstrate how carefully and thoroughly an applicant for the certificate works up his cases; whether he keeps track of essentials in family and case history, signs and symptoms—or whether he gets lost in irrelevant matters. Perhaps the most important factors in a history—what does the patient complain of? and what facts in his remote or immediate history have a bearing upon this complaint? are often buried

under a mass of unnecessary genealogic and epidemiologic data. *It should only be necessary to recall the great number of papers given before our special societies, in which long and tedious case histories burdened with irrelevant details have effectually masked the author's thoughts and have distracted the auditors' attention from his conclusions.*

Let the first requisite then be a concise statement of facts which helped to solve the case and make a working diagnosis. These may be set down in outline form or in complete sentences; but abbreviations and such short cuts as cards with printed sinus diagrams or rubber stamped hearing test forms, however convenient they may be for office records, are scarcely acceptable as adequate case histories. Such devices are rarely detailed enough to be intelligible to the reader who is looking for quick conclusions.

Quite the opposite is true of the multiple forms issued by the College of Surgeons, which require much rereading and turning back and forth, since they have of necessity accumulated from various sources during the stay of the patient in hospital, and cannot of necessity be condensed upon one or two sheets during that time. For our purpose, it seems wise to suggest that essential findings from the various forms can be condensed into a continuous narrative on one to three pages of typed manuscript. To this such details as graphic temperatures, audiometer records and the like may be added. The entire nurse's record is unnecessary; vital facts may be extracted from it when needed. Blood-counts and urinalysis may be summarized briefly; and radiologic findings as well. Diet lists, detailed serologic tests, allergy reports need record only of the pertinent results. Record of vestibular and hearing tests should, if recorded, be reasonably full.

The reader, in other words, ought not to be obliged to struggle through a maze of forms and reports (as, in spite of interns, nurses and history clerks, he must frequently do in well-ordered hospitals), in order to find out what seems wrong with the patient and what the doctor thinks should be done about it. These, after all, are the aims of history taking. Medical literature is much cluttered up by the record of meaningless negative findings. Those otolaryngologists who are fortunate enough to

attend well-conducted general hospital staff meetings will profit by the extemporaneous boiling down process which is enforced during the verbal delivery of case reports. Perhaps we have been shoved off to ourselves in the average general hospital, by the omnipotent general surgeons; we should copy the virtues rather than the faults of their admirable if voluminous history system. It is interesting and stimulating, in this regard, to examine the brief yet thorough case notes of Holmes, Hilton, Weir Mitchell or Osler; in our own field, those of Casselberry, Delavan, Loeb, Emil Mayer and many another: simplicity, directness, brevity; above all, honesty.

Reports of operative procedures may well be shortened by the omission of standard descriptions of surgical technic. A "simple" mastoid will need to have added only the description of such variations and anomalies as may be peculiar to the case in question, and what may be done about them; how the wound was closed, how dressed; similarly, with "radical" and "conservative radical" mastoids. Repetition in somewhat stilted and identical terms of a long formula for operation is suggestive of copying from some favorite textbook, and reflects no credit upon the history writer's originality. Because of differences in teaching and in technic, some care should be given to description of intranasal or external sinus operations, though here certain typical procedures, a Killian, a Lothrop, a Caldwell-Luc, a Denker, need no definition. Similarly, with standard tonsil operations, while laryngeal and bronchoesophageal procedures require some detailed description. What were the outstanding facts about the operation—anesthesia, anatomic peculiarities, hemorrhage, and especially gross pathology?

Here it seems pertinent to comment upon the failure of many otherwise excellent historians to interpret their operative findings in terms of pathology. Unless a biopsy be done, or unless bacteriologic findings be sought (both interpreted by technical experts), little reference is made to the character of membranes and exudates, to the existence of allergic or parasitic phenomena, or to local impairments due to lesions of the nervous, circulatory or renal systems. Painstaking study, based upon postmortem examination, repeated dissection, and study of gross and microscopic specimens, have in the past been over-

shadowed in many special lines of American postgraduate preparation by early insistence upon clinical proficiency and operative skill. Fundamentals of tissue change in health and disease have been virtually forgotten on the completion of undergraduate medical training, and their interpretation has been left to general pathologists and laboratory technicians unacquainted with the highly specialized field in which the otolaryngologist works. It is of course unnecessary for our purpose to repeat the full text of each postmortem protocol; but the value of histories of fatalities is tremendously enhanced by adequate record of the special and secondary pathologic findings. The accuracy and courage in this regard of numerous historians whose work has come before the board calls for high praise. It is not necessary that a record of unbroken successes be submitted; careful analysis of failures and mistakes teaches us much more.

It should not be necessary to call attention to such obvious errors in case reporting as the copying over, fifteen or twenty times, of such entries as: "1/21/26. Retd. Impvd. Swabbed wd. *c* $AgNO_3$." Very brief statement of the general trend of after-treatment, its duration and such aids to healing as proved useful, will take but a line or two. Statement of the number of days in hospital, and of days or weeks of after-treatment, is preferable to the listing of long lines of dates from which the reader must make his own calculations, both as to the value of a given operation and as to the worth of given methods of treatment.

Not infrequently, on the analogy of the usual hospital history sheet, one finds otherwise excellent case reports lacking entirely in conclusions. Again, the reader has to figure back and decide what the probabilities were. Rarely are conclusions or deductions given based on a report of the patient's condition some time after discharge; this is, of course, due to our rather general failure to follow up our results after immediate cure is attained. Occasionally the historian makes shrewd and accurate generalizations on a group of associated cases, or respecting some treatment which he has found effective. These items are, in general, most acceptable additions to the history. In some cases, however, as with reports of operative technic, sudden difference in literary style has aroused suspicion that

unacknowledged quotation was being made; and this gains no credit.

The best histories presented have been double spaced and typewritten on plain 8½ x 11 paper, leaving broad margins. The typed copy should be reread by the author and misspelling and incorrect sentences set right. Few office or hospital stenographers are familiar with our special terminology. The average case record will cover one to three pages if clinical reports are briefed in the text and not included on separate sheets. These important records must not, of course, be omitted when they are needed; but long and bulky blanks do not need to be copied in detail. Nor is it essential that the names of all instrument nurses and similar personnel be mentioned; assistants and consultants contributing directly to management of the case may be included. Original radiographs are bulky and valuable and may be damaged or lost; photographic prints from them are often as useful. In fact, by summarization of well-worded radiologic reports the sending of films may generally be avoided. Photographs of patients are welcome if essential to a clear history; but the story should be well enough told without them.

It is not necessary to place each history in a separate folder or binder; but each should receive its serial number, from "1" to "10" or "25," and this case number should appear on each page of the given case report, as: "Case 1—page 3," for example, with the author's name. Then all sheets of each case should be firmly clipped or stapled together. In this manner loss and disarrangement may be readily avoided, and the clerical tasks of the board members made easier.

In general, it must be acknowledged with distinct pleasure that the otolaryngologists of America have collected a remarkably interesting group of cases for submission to their board. This is a most valuable source of technical and statistical material, and it is hoped that those whose painstaking work has been thus collected will not, as it is returned to them, suffer it to remain unused. In this series one finds notable testimony to the improvement of American tonsillectomy technic over that elsewhere practiced; to the increasing trend toward radical antrum operations under local anesthesia, and increasing conservatism toward the ethmoid; to the added skill of

otolaryngologists in interpreting their own radiographic findings; to the definition of special types of bone involvement from special bacterial infections of the middle ear; and to many other indications of the broadening influence of the various special societies and periodicals upon otolaryngologic practice during the past ten years.

Histories are submitted also, sometimes rather grudgingly, by the self-sufficient individual who thinks he is pretty good. This man is not a member or local or national societies; he does not read or attend meetings, for he is "too busy." Generally he has not visited clinics away from home since the completion of his postgraduate study, and he carries on a money-grubbing practice without any charitable affiliations or teaching positions. Such a man, attempting suddenly works of repentance, is unable to speak with honest conviction. His attempt to "write up histories" rings false, and he is discovered to be rather pitifully careless, inept, unacquainted with the machinery of progress, even where he possesses some routine technical skill. Few indeed are such among the properly trained graduates of recent years. It should be said to the lasting credit of several men who had perhaps not realized their intellectual stagnation, that failure before the board taught them their weakness and encouraged them to study, to renewed effort, and to the eventual winning of the coveted certificate.

Preparation of case histories is not least among the factors which teach the otolaryngologic practitioner his weak points. If a man has become so careless that he does not realize the worthlessness of copying the hasty scrawls of overworked interns, if he does not know how to interpret what he sees in his own cases, if he takes no pride in the accuracy of his work, he can scarcely be called a safe practitioner. Certainly he is not entitled to be admitted to the self-disciplined and voluntary fellowship of those who hold the certificate of the Board of Otolaryngology.

XCI.

ACUTE ACCESSORY SINUSITIS AND ITS MANAGEMENT.*

By Thomas J. Harris, M. D.,

New York.

Among the many weighty contributions that bacteriology has made to medical science none is farther reaching than its demonstration, from a pathologic standpoint, of the close and intimate relation of the various organs of the body. Eighteen hundred and more years ago the great apostle to the Hebrews declared: "If one member [of the body] suffers all the members suffer with it." It has remained for the last fifty years to bring home the deep meaning of this truth in the realm of medicine. The nasal accessory sinuses are outstanding examples of the interrelation in the body of a group of cells until recently little known. Because of this interdependence and the important bearing it has in well nigh every field of medicine, the subject before us demands the consideration not merely of the rhinologist but of the worker as well in every other field of medicine.

As is well known, the paranasal sinuses constitute a series of air-containing spaces communicating with the nasal chambers. This fact renders them constantly liable to organismal infections. Because of their contiguity to the orbit and cranium they are the possible source of infections of those cavities and can give rise to a number of vague, ill-defined symptoms which are ascribed to other causes. We know now that a large group of eye diseases, including retrobulbar neuritis, may have its origin in the nasal accessory sinuses, while meningitis and brain abscess at times can be traced to a purulent affection of these cavities. Not only are they the source of disease in cavities and organs adjacent to them but through the blood and lymph stream they can be responsible for involvement of remote or-

*Delivered in the course of practical lectures before the New York Academy of Medicine, December 9, 1927.

gans, giving rise to so-called rheumatic pains, arthritis, endocarditis, nephritis and even general septicemia. The constant escape of poison into the blood may cause toxemia with symptoms of neurasthenia, and the drainage of pus into the throat, where it is likely to be swallowed, may give rise to pharyngitis, laryngitis or gastritis. Emphasis should be placed on the importance of the rôle played by the accessory sinuses as a focal center. Compared with that of the teeth and the tonsils, it is undoubtedly a minor one, but, taken in the aggregate, the number of cases is not inconsiderable and the possibility of such a focus is always to be borne in mind. This conveyance of infection through the blood stream applies not merely to remotely situated organs but also, in the opinion of L. E. White[1] of Boston, as expressed in an address delivered here a few days ago, to the orbit and the orbital nerve as well. According to him, direct infection and not extension by contiguity is the usual mode of conveyance, an opinion shared by many others. White has gone still further and has abandoned his former views of the frequency of the sinuses as etiologic factors in affections of the orbit. In his last 50 cases the teeth and the tonsils were the two outstanding causes; only a solitary case was found where the sinuses proved to be the sole cause. For these and many other reasons an acquaintance with all that concerns the accessory sinuses is highly desirable for practitioners of medicine, irrespective of their particular specialty.

HISTORY.

There is no evidence that the paranasal sinuses were known to the ancients, and it is doubtful whether even Galen, living in the second century A. D., had any knowledge of them. The first to describe them was an Italian by the name of Beranga, who taught in the University of Bologna in the early part of the sixteenth century. Vesalius, about the middle of this century, also described them and stated that they were filled with air. Following him, Highmore, Meibonius and others made contributions to the surgical treatment of the maxillary sinuses by means of alveolar drainage, but the knowledge of the anatomy, pathology and treatment of diseases of the sinuses during the eighteenth century and down to our own day was exceedingly limited. J. Solis Cohen's textbook on "Diseases of

the Throat," a standard volume of over 500 pages, which appeared in 1872, makes no reference to any except the frontal sinus. Awakening of interest and knowledge of them first followed the appearance, in 1882, of Zuckerkandl's "Normale und Pathologische Anatomie der Nasenhöhle und ihrer Pneumatischen Anhange." Since that time dates the modern treatment of chronic suppurative affections of the sinuses, and the articles upon them have been well-nigh legion. The literature of acute affections of the accessory sinuses, on the other hand, is surprisingly limited.

REVIEW OF ANATOMY.

In order intelligently to consider the subject it will be necessary to review briefly some of the anatomic facts having to do with it.

Until the last few years attention was directed chiefly to infections of the accessory sinuses in adults. In some incomprehensible way the profession seemed to have the impression that the sinuses of a child were immune. Recently a great awakening has taken place in this particular, and today we have come to the realization that sinus infection in children is very common and is very far-reaching in its consequences. The explanation for this error rested largely on the impression that prevailed that the paranasal sinuses in infancy were not present, or present in only a rudimentary form, and so did not possess the requisite size to permit of pathology. The inaccuracy of this was demonstrated by Killian, Coffin and Davis among others, who have shown that all the sinuses are developed at a very early period in infant life. According to Davis, the frontal sinuses can be demonstrated as early as the third year, the maxillary sinuses at birth, the ethmoid at birth and the sphenoid at one year of age. The frontal and maxillary sinuses continue to enlarge until the age of puberty. The paranasal sinuses bear the same relation to the nose that the mastoid antrum does to the middle ear: they possess, in a normal condition, direct channels of communication and are lined with the same type of mucous membrane and so, from the physiologic standpoint are, in effect, continuations or outlying pockets of the nose. Whatever affects the nose is liable to affect the sinuses connected with it. It was at one time believed that the

paranasal sinuses all conformed to a definite shape and size. This has long been shown to be erroneous, and we know now, thanks to the accurate work of Onodi and Loeb, that not merely do the accessory sinuses of one individual differ in size and shape from those of another but the sinuses in the same individual on one side may bear very little resemblance to those on the other. Indeed, so far as the frontal sinuses are concerned, in a considerable percentage of cases, one of the sinuses is absent; and Davis has shown that occasionally a double sinus will be found on one side, to be explained by the well-recognized development of these sinuses through offshoots into the frontal bone from the ethmoid. While we are in the habit of speaking of four sinuses in each nostril, it is for clinical purposes far more satisfactory to speak of an anterior and posterior group of cells, the anterior ethmoid maxillary and frontal comprising the former, and the posterior ethmoid and sphenoid the latter. This division is based on the usual mode of drainage of these sinuses. There are many exceptions, however, to this rule, and the attentive observer will constantly find cases of maxillary sinusitis and even of frontal sinusitis draining posteriorly, while not infrequently the sphenoid will be seen to be discharging anteriorly.

One of the most important anatomic contributions on the sinuses is that of Loeb,[2] in which he set forth the relation of the sinuses to the eye. Loeb has shown that the posterior ethmoid cells and the sphenoid sinuses are in many instances in close relation to the orbit and to the optic nerve. Reference also should be made to the intimate lymph and blood connection of the sinuses, in itself always a potential means for the conveying of infection.

CLASSIFICATION.

When one speaks of an acute disease of the accessory sinuses he usually refers to acute suppuration of these cells. While this is by far the most commonly recognized form, an acute catarrhal sinusitis is a distinct entity and indeed represents the majority of cases, although far less apt to be recognized. The catarrhal form theoretically always precedes the suppurative form. Many cases, however, never extend beyond this stage.

Besides the acute catarrhal and the acute suppurative, recently an acute serous type has been described, and, according to Hajek,[3] there is still a fourth form, the diphtheritic. Strictly speaking, in the light of recent histology and pathology, it is a mistake to speak of acute sinusitis in any form. With the intimate relation which exists between the nose and the sinuses, we are justified in assuming that in every case of acute rhinitis there is an involvement of the accessory sinuses to a greater or less extent. This has led Beck[4] to name the affection "acute rhinosinusitis," which much more accurately describes it. The form of acute sinusitis best known to the clinicians of the last century was the closed form with its characteristic group of symptoms. As difficult of recognition as this is easy is the latent type, in which neither pain nor other localizing symptoms are wont to be present. There occurs, fortunately only rarely, an acute fulminating form, grave in its nature from the onset. The borderline in many cases is difficult to establish; many acute catarrhal cases imperceptibly pass into the acute purulent form, and if not checked, from that into the subacute and chronic. Finally, acute sinusitis of children is symptomatically a distinct entity.

BACTERIOLOGY.

According to Lewis and Turner,[5] the accessory sinuses are probably normally sterile, while the healthy nasal chambers connecting contain organisms with little virulence compared with those present in inflammatory conditions. The result of their study is that pyogenic cocci are more responsible than bacilli for sinus suppuration and that four main types of cocci are commonly met with, namely: pneumococci, streptococci, staphylococci and diplococci of the type of micrococcus catarrhalis. Among the groups of bacilli found at times are: (a) B. coli and its allies; (b) putrefactive bacteria, such as B. proteus; (c) a diphtheroid group; (d) B. influenzæ; (e) dental organisms, B. gangrenæ pulpæ and B. necrodentalis; (f) an obligate anaerobic group containing B. perfringens and B. ramosus. The two latter groups occur usually in the maxillary sinus.

Macpherson[6] found staphylococcus aureus in 14 out of 17 cases of acute maxillary sinusitis.

ETIOLOGY.

As has just been shown, the vast majority of cases of acute sinusitis are dependent upon a previous or concomitant acute rhinitis. Whatever interferes with the ventilation and drainage of the sinuses, such as a deflected septum, enlarged middle turbinate, etc., serves as a predisposing cause. In all cases of severe colds in the head, with or without pain, we are warranted in assuming that there is a sinus involvement. The acute exanthematous diseases, especially influenza, scarlet fever and measles, also pneumonia, are common exciting causes of acute sinusitis. In these cases the channel of communication is usually through the lymph or circulatory system. Trauma is accountable for sinusitis in a limited number of cases; disease of the teeth, not to the extent it was once thought, should be mentioned as an occasional cause; also sea bathing and even, as Fenton and Taylor have pointed out, bathing and swimming in fresh pure water. In Fenton's[7] opinion, swimming and diving interfere with the protective apparatus of the nose, destroying by osmosis the cell vitality; the specific protecting substance of the sinus secretion is diminished or lost by being washed away, and later, secretion is inhibited by the edema and degeneration of the secretory cells. An additional factor is the washing into the sinuses of pathogenic germs from the nose and throat of the swimmer, where they are retained by the swollen membrane, while a third cause, in his judgment, is direct trauma to the ostia by the onrush of the water in the nose.

PATHOLOGY.

The pathology of acute affections of the sinuses has been carefully studied by Zuckerkandl, Weichselbaum and later by Dmochowsky, Manasse, J. S. Fraser, Beck and others. The picture is a characteristic one. There is at first a venous engorgement, followed immediately by transudation, then free fluid, scant in organisms, except in disease of the maxillary sinus. With the engorgement comes edema, especially around the ostia, even to complete closing. If this shuts off all drainage, there results a round cell infiltration, together with arterial dilatation even. It is not agreed whether simple catarrhal sinusitis can occur without permanent pathologic changes. If the

inflammation becomes purulent, there is acute edema, a moderate hyperemia with scattered hemorrhages in the tissues and a layer of pus on the surface. Microscopically the mucous membrane is covered with dry epithelium, which is infiltrated with leucocytes, chiefly polymorphonuclear. The edematous infiltration is much less pronounced than in the acute catarrhal type. In the majority of cases the inflammation remains limited to the mucous membrane, but in rare instances the bone is involved, with perforation into the orbit.

SYMPTOMOLOGY.

The symptoms of acute sinusitis depend largely upon the character of the infection and the condition of the bony structures of the nose in their bearing upon the normal drainage through the natural openings. In acute catarrhal sinusitis the symptoms are usually so indefinite that this form of sinus disease is very apt to be overlooked. Bound up as it is invariably with acute rhinitis, vague uncomfortable sensations referred to the head or face are the extent of the complaint. A moderate amount of mucoid or mucopurulent secretion is usually present. In rare instances the secretion is so slight as to warrant being described as absent; in other cases it passes on into the purulent form of sinusitis. Acute purulent sinusitis is characterized by two outstanding symptoms: pain and secretion. This statement requires qualification: while pain in a general way may be said to characterize an acute suppurative sinusitis, the severity of the pain and indeed its actual existence depend upon the particular sinus involved, although it must always be borne in mind that more than one sinus can be affected; indeed in the majority of cases an inflammation of at least two sinuses is the rule, and often a pansinusitis exists. However, it fairly may be said that pain is chiefly found only in inflammation of the frontal sinuses. The sphenoid and ethmoid rarely give rise to pronounced pain, and in acute maxillary sinusitis the pain is only occasionally noted. When present it is never as severe as in frontal sinusitis. It is usually described as dull and instead of invariably being situated in the cheek bone it can be referred to the teeth or to the top of the head. Observers have also noted it behind the ear. In our experience it is at times located in the forehead and so can easily be confused with the

pain of an acute affection of that sinus. Pain, when present in acute ethmoiditis, is mild in degree and centered between the eyes; while in acute sphenoiditis the location of the sinus and its relation to the several branches of the fifth nerve makes its site when in evidence a varied one; at times behind the eyeballs, in the site of the head, even in the forehead. Indeed so general is its distribution that it is undoubtedly often overlooked.

Pain in acute frontal sinusitis is the rule and is very characteristic. Rarely is this sinus involved without pain being complained of at some stage of the disease. In fact, it is the pain that is likely first to direct attention to the trouble. The pain is of two kinds: a continued annoying but not usually severe pain, lasting day and night; and a periodic pain peculiar to the disease, beginning at a given hour in the day, generally in the morning, and ending a few hours later. This pain is found associated with tenderness upon pressure in the region at the inner angle of the floor of the frontal sinus known as Ewing's area. Recently we have seen a number of cases which referred the pain to the exit of the supraorbital nerve. This pain is so severe as to make acute frontal sinusitis one of the most dreaded of affections. The steady, uninterrupted form of the pain is to be explained by swelling of the sensitive sinus periosteum. It is not so easy to explain the appearance of the pain at definite hours of the day and its location in the frontal sinus independent of the sinus affected. Swelling of the anterior end of the middle turbinate will explain this pain in a certain proportion of cases. In the opinion of Weleminsky,[8] another cause is to be found in a circulatory disturbance in the mucosa of the middle turbinate as well as an inflammation of the posterior superior nasal nerve traversing it. This nerve inflammation is based on a theoretically assumed termination of the nerve in the mucosa of the sinus.

Secretion.—Secretion in acute sinus disease varies within extreme limits, according to the type of inflammation and the intensity of the infection. A form recently described, acute serous sinusitis, will show slight or no discharge. This has been found to be true of some cases of catarrhal involvement. It is strikingly true of the closed sinusitis with orbital or meningeal complications. The discharge in a case of acute

frontal sinusitis may be at no time pronounced. Of all the sinuses the one most apt to discharge freely, as easily may be understood from its size, is the maxillary sinus. Here the secretion is likely to be great, although even in antrum disease at times the discharge is surprisingly small. It must be borne in mind that not infrequently intractable cough is due to the drainage into the throat of secretion of one of the accessory cells.

Odor.—Odor is a characteristic symptom of disease of the maxillary sinuses. This has sometimes been thought to be due to a nerve involvement, but undoubtedly the true explanation is to be found in the character and quantity of the pus itself.

In all cases of acute sinus disease of any extent, general malaise, with or without slight temperature, headache and disinclination to work are the rule. Only in the fulminating type, or, in cases where the acute affection is grafted on to a chronic one, are the symptoms liable to be severe. Here high temperature, excessive pain, meningeal and orbital complications can be met with.

Sinusitis in Children.—Acute sinus disease in children is now recognized as an exceedingly frequent occurrence. On account of his tender years, the child is not likely to call attention to the trouble. The ordinary case is regarded as merely a severe cold. There are often one or two degrees of temperature, and the child, if old enough, which is not till six or seven years of age, will complain of discomfort in the head. There may be also gastrointestinal disturbances with periodic vomiting. In the comparatively rare cases of the closed type the symptoms will be much more intense, the fever higher, and reddening and swelling in the region of the eye and the forehead will occur.

DIAGNOSIS.

The diagnosis of acute sinus disease, especially if unilateral, as a rule is not difficult. Pain referred to above the eye associated with purulent discharge on the side affected, of short duration, is sufficient to warrant a tentative diagnosis. In the absence of pain and with limited or no discharge, the problem is quite a different one. The fulminating type can be mis-

taken for meningitis or a primary affection of the orbit, and cases of catarrhal sinusitis, on account of the mildness of the symptoms, can be overlooked or confused with acute rhinitis. The periodic form of pain found in frontal sinus disease can be taken for a supraorbital neuralgia. The establishment of the diagnosis does not rest with the mere eliciting of the symptoms of pain and discharge. A careful rhinoscopic examination is desirable in every case for the purpose of determining (1) the presence of secretion and (2) the sinus or sinuses from which it proceeds. The maxillary sinus it most commonly involved and so never should be overlooked in the systematic study of the case. The examination will show a more or less pronounced swelling of the middle turbinate which if already diseased may become so swollen as entirely to occlude the spaces between it and the outer wall of the nose and the septum. Pus usually will be visible on one side or the other of the middle turbinate and, when it is profuse, on the floor of the nose also. Where pus is absent at the time of examination, it often can be recovered by the employment of negative pressure after contraction of the middle turbinate by the use of a weak solution of cocain and adrenalin. While the diagnosis of acute sinusitis is usually a simple matter, the determination of the sinus or sinuses which are involved is not so easy. Pain and tenderness in Ewing's area or above the eye, of a periodic nature, point to involvement of the frontal sinus, but, as has been stated, the identical pain can proceed from an involvement of the maxillary sinus. The location of the secretion in the nose is always of importance. If the secretion is situated on the outer side of the middle turbinate high up in the nose, it points to an involvement of the frontal sinus. Lower down on the same side the maxillary antrum is more likely to be the source. Secretion on the inner side of the middle turbinate in the fissura olfactoria suggests posterior ethmoid or sphenoid sinus drainage, but experience has shown that too much emphasis upon the location of the pus is apt to be misleading. Exploration of the antrum, either through the natural opening or through an artificial opening in the inferior meatus, may be necessary for purposes of diagnosis. It is not, however, to be recommended as a routine procedure. Much information can be obtained from a good roentgenogram, although it is to be borne in mind

that a sinus that has once been affected is liable always to show some cloudiness. Transillumination by means of the electric lamp is many times of the greatest value, particularly in the diagnosis of acute antritis; to a less extent this is true when the frontal sinus is involved. Contrary to the opinion that is sometimes given, attempts to irrigate the frontal sinus are not advisable. Occasionally the diagnosis of acute sphenoiditis can be established by irrigating that sinus through the anterior opening. In doubtful cases the nasopharyngoscope often will prove of aid in discovering secretion.

PROGNOSIS.

The prognosis in a simple uncomplicated case of acute sinusitis, whichever cavities are involved, so far as recovery is concerned, is good. The vast majority of cases, considering the universality of the infection, get well. Of the cases which come to the attention of the physician the majority make a satisfactory recovery. The acute catarrhal form may resolve or may pass into the purulent type, and the purulent type, if the nasal cavities show faulty construction so far as ventilation is concerned, may become chronic. Diphtheritic sinusitis is regarded by some as much more common than has been supposed and is bound to add to the severity of the prognosis in the case of nasal or faucial diphtheria. Of all the forms, closed sinusitis offers the gravest prognosis. Under proper and adequate measures, even here recovery is the rule. It is undoubtedly true that a patient who has once had an attack of sinusitis is liable to similar attacks. The explanation of this, apart from any lowered resistance, is to be found in an abnormal condition of the nose and throat. We cannot too emphatically state that deflection of the septum high up and an obstructing middle turbinate as well as diseased tonsils are conditions that render a patient liable to a return of the disease.

TREATMENT.

The treatment of acute sinusitis is preventive and curative. The one is no less important than the other. Preventive treatment seeks to remove the contributing cause or causes, chief of which, as has been pointed out, are abnormalities in the nose obstructive to proper ventilation and drainage. The most com-

mon form of obstruction is a high deflection of the septum pressing on the middle turbinate which is apt to be in contact both with the septum and the outer wall of the nose or becomes in contact, so narrow is the cleft, the moment that there occurs any swelling of the mucous membrane. If such predisposing cause or causes exist, the nose itself is in all probability in a stage of chronic inflammation and is the reservoir of germs ordinarily dormant, but at once becoming active if some exciting cause, such as a disordered intestinal canal, exists to arouse them. Proper nasal surgery in such cases is likely to be of great benefit. In our hands a vaccine made of the nasal bacteria has been found efficacious in many cases. Where all preventive measures fail it will be necessary to consider the advisability of recommending a change of climate during the inclement season. In the treatment of sinusitis in children the importance of a fat-soluble A diet as a means of prevention should not be lost sight of.

Curative treatment is to be spelled with six words: *relief of pain; promotion of drainage.*

The pain of acute sinusitis demands prompt and adequate treatment. It can be alleviated or temporarily overcome by various procedures. The lasting removal of the pain depends upon abatement of the inflammatory process in the sinus and nose producing it. The pain of acute sinusitis is especially susceptible to the coal tar products and the employment of drugs like aspirin in 5 grain doses at frequent intervals is indicated. The employment externally of heat or cold is always in order and usually of benefit. It is impossible in a given case to say which of these measures will prove of the greater benefit. Sometimes an ice bag will accomplish the desired result; at other times, hot applications. One of the most satisfactory ways of applying heat is by means of the Brüning light bath. This consists of a box made to fit the head and provided with a group of strong incandescent lamps. Internally, sulphate of atropin in 1/100 grain doses three or four times a day will prove beneficial. Tincture of bryonia and tincture of aconite in homeopathic dilution also are recommended. Cases of acute sinusitis call for the same treatment as acute rhinitis, so far as instituting measures for thorough elimination are concerned. It is our practice to prescribe a liberal dose of castor oil, fol-

lowed at the proper time by a suitable enema. Faulkner is in the habit, at the beginning of the attack, of inducing sweating by means of a Dover's powder. Local treatment, properly selected, is of the greatest value in overcoming the inflammatory process. It may be said with much emphasis that acute sinusitis cases rarely require surgical intervention. Except in the fulminating cases with threatened orbital or meningeal involvement, operative treatment usually is not required. Bearing in mind that the indication for treatment consists in the promotion of drainage, and that drainage is interfered with or actually shut off because of the swelling of the ostia and mucous membrane of the middle turbinate, it is first desirable to contract these tissues. For this purpose, adrenalin and cocain are commonly recommended and employed. In our judgment this is, except with certain reservations, an unwise and even dangerous procedure. Adrenalin has a powerful contracting power and so seems exactly to meet the need. The great drawback to its use is that the contraction is only temporary and is likely to be followed by a corresponding engorgement. Cocain does not possess this disadvantage, but, as is well known, it is one of the most common of habit-forming drugs. The practice of prescribing it for home use cannot be too severely condemned. When employed, it should be used in a weak solution only by the physician, never by the patient at home. Far more lasting in its beneficial effect is menthol in some form, either by spray or ointment. Recently ephedrine in the form of a spray has proved very efficacious.

After the parts have been contracted, the nose should be thoroughly cleansed. For this purpose a warm saline irrigation is the simplest and most satisfactory measure. After thorough cleansing of the nose negative pressure is to be employed. Regarding the benefit of negative pressure there is a difference of opinion. In the writer's hands it has proved of incalculable value in the relief of pain and the promotion of drainage. The objection has been made to its use that it does not thoroughly empty the sinus. However true this may be, in some way relief constantly will be met with after one or two drops of secretion have been brought away. When the head has been thoroughly cleansed (and for this purpose, at times, free drainage will be promoted by placing the head in a position so that gravity

will operate), the middle turbinate should be painted with a fresh solution of one of the synthetic silver preparations or with a weak solution (½ to 1 per cent) of nitrate of silver. In place of this, the nasal pack, containing one of the above preparations, allowed to remain in situ for ten to fifteen minutes, has given satisfaction. According to the severity of the attack, this treatment is to be repeated daily or even twice daily. All cases of acute sinusitis will do better confined to the even temperature of the house and in one room, and even remaining in bed. At home the patient should make use of hot saline irrigations at intervals of every two or three hours. We are aware of the objection that has been made to irrigations in unilateral sinusitis, that there is danger of conveying the infection to the healthy side. We have never experienced this, however, and do not regard it of sufficient moment to justify the omission of a most valuable therapeutic agent, used, of course, under the strictest precaution, such as the avoidance of undue pressure. These measures will serve in the majority of cases to reduce the swelling and promote drainage. Of course, it is understood that the fluid does not enter the sinuses.

If such cases do not respond promptly to this treatment, hot inhalations of tincture of benzoin compound with menthol in the proportion of 1 dram of menthol to 4 oz. of tincture of benzoin compound, using 2 teaspoonfuls of the mixture to ½ pint of boiling water, may produce the desired result. In cases where there is a decided obstruction to drainage on account of a deflected septum or middle turbinate hypertrophy, and where topical treatment does not relieve the pain, it will be necessary to do a partial turbinectomy or a limited submucous resection. Operations during an attack, however, should be avoided, if possible, for fear of extending the infection. As a substitute, a temporary fracture of the turbinal toward the septum is to be recommended. Contrary to the advice and practice of certain eminent rhinologists, we do not favor antrum puncture and irrigation as a routine measure. The procedure is liable to be a painful one and is not entirely free from unpleasant consequences. The majority of cases will get well without such procedure. If, however, the symptoms do not abate in the course of a few days, irrigation through the natural opening in the middle meatus or through an artificial opening in the inferior

meatus is in order. We have had no experience with the newer remedies and know of nothing to be preferred for irrigation to the hot normal saline solution. We have not made use of vaccines, but Dr. J. L. Davis[9] has reported most satisfactory results from their employment. In 400 cases treated by him, ranging in age from two to sixty-four years, he has noted 50 per cent of increased efficiency in establishing a cure. He employs a staphylococcus-streptococcus combined vaccine in individual syringes of graduate doses; No. 1 containing 100 million staphylococcus and 25 million streptococcus. Within thirty hours of the onset of attack in his own case there was improvement in every symptom twenty-four hours after the first injection; the second dose, double the amount of the first, was given forty-eight hours after the first. In the majority of cases, at the end of the fifth day, the discharge had entirely ceased and the nasal congestion subsided.

CONCLUSION.

In conclusion, we desire to emphasize the following points:

1. That acute sinusitis is an attack, in the vast majority of cases, of an acute rhinitis and so is an exceedingly common affection.

2. That the most common form of acute sinusitis is the catarrhal type, which on account of the mildness of the symptoms easily can be overlooked.

3. That the secretion varies in amount within wide extremes and not rarely drains entirely into the throat.

4. That acute sinusitis in children is a common occurrence, often passing unnoticed.

5. That the sinuses are always to be considered as possible focal centers of infection.

6. That it is important promptly to institute suitable treatment to prevent the cases becoming subacute and chronic.

7. That all surgical procedures during the attack should be avoided, unless especially indicated, to prevent possible extension of the infection.

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XCII.

THE EVOLUTION OF THE HUMAN FACE: ITS SIGNIFICANCE IN THE FIELDS OF RHINOLOGY AND STOMATOLOGY.

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The study of the evolution of the human face was undertaken with twofold object—first, to find the origin of the nasal accessory sinuses, and possibly a hint as to their purpose and physiology; and second, to acertain whether nasal and oral pathology is influenced by the evolutionary factors in their morphology. A solution of these questions has by no means been reached, but there is little doubt that the susceptibility to disease of certain retrogressive and vestigial structures is in part due to evolutionary changes, as exemplified so typically by the third molar and the vermiform appendix. This paper will be limited to a study of the morphology of the face and head of man, as compared to that of vertebrates, especially mammals.

HISTORY.

Our bodies have become what they are today only through many and profound changes, improvements and adaptations to function throughout innumerable ages of constantly changing conditions of life. The finite mind is unable to grasp even faintly the time necessary for Nature, through the processes of evolution, to produce orders, genera and species. Eons are but moments, and evolutionary changes are never hurried. Geologists[9] estimate that it required two million years for the elephant to lose one tusk, one million years for the horse to lose one toe, and man five hundred thousand years to lose his tail—five segments of it still remaining. A half million years ago man began to stand on his two feet, and his body is not yet adjusted to an upright gait.

A study of the comparative history of the human body—that is, the evolution of man, and especially that of the human face

—is most fascinating and should prove of special value and interest to the student of rhinology. Four distinct fertile fields[29] are constantly yielding valuable data; paleontology, with accumulation of fossil remains as evidence of a changing past; comparative anatomy, showing convincing evidence of analogous and similar forms and functions to that of other organisms; embryology, revealing daily changes in fetal morphology; and lastly, the study of individual variations may show acceleration or retardation as compared to the species as a whole, and reflect not only our past but also suggest possible future changes.

EMBRYOLOGY.

According to Haeckel's biogenetic law, "individual development during fetal growth repeats, generally speaking, ancestral conditions." In other words, embryology recapitulates, and in a sense, corroborates, paleontology. For example, the embryo toothless whale[30] furnishes evidence of its progenitors possessing a mature dentition. The transitory gill clefts in the human embryo represent a "phyletic contraction," a "purposeless survival" of aquatic conditions, pointing to the "same stem for man and fish."

As representing a structure of a passing untold genetic duration may be mentioned the milk line of the human embryo, which is evidently atavistic,[23] as is the vomeronasal or Jacksonian organ in the septum, and about 200 other vestigial structures in the human body.

ENVIRON.

Changing environment and conditions cause reaction in the organism, necessitating modified function, and in response thereto modified structures and organs better adapted to the new conditions; hence, the varied adaptations and variations resulting in the long line of ancestry from the simple unicellular organism to the multicellular organism, through the lower to the higher simple forms, through the various genera including the invertebrates, the vertebrates, and of the latter the amphibia, reptilia, mammalia, the primates, anthropoids, homo sapiens, and finally the various races of man.

VARIATIONS.

Individual variations and personal characteristics, however, according to Schultz,[29] are not due to environmental factors, such as diet, climate and occupation, and are apparent not only during growth, but are present in the fetus and embryo—variations as great as are seen in the adult, and before environment has had a chance to act. He mentions cephalic indices of single ovulations amounting to 77.4 and 83.1 in cases of fetuses of 21 weeks; 78.2 and 81.5 in those of 8 months; 80.5 and 84.2 in girls of 14 years, and 69.5 and 72.2 in twins of 22 years.

Hazards and vicissitudes[3] in the lives of mammals in their struggle for existence have necessitated some to seek safety by burrowing into the ground, some to adopt aquatic life, some to choose an arboreal existence, while still others like to live in herds, and acquire protective coloration as camouflage and as an aid in hunting. And so we have the Rodentia, Cretacia, Quadrumina, Ungulata, etc. The sense organs of the various mammalia have become developed according to the favorable or unfavorable conditions of their environment. Herbivorous animals, depending upon fleetness for safety, acquire a keen sense of smell and hearing and are able to discern danger at a distance. They grasp their food with their mouths, choosing that which is suitable more by smell and by touch of their sensitive noses than by sight. They develop panoramic vision. Through olfaction and vision the Carnivora obtain their prey. Ability to see through dim light rather than acuteness of vision is developed. Apes and anthropoids, who have found safety in trees by using their arms as prehensile organs, require accurate sight for swinging and jumping from limb to limb, but not so great need for smell. Consequently they have shorter snouts, eyes in front of the head and binocular vision, capable of accurately estimating distance, and picking up small bits of food in their hands. They, therefore, do not have need for elongated snouts. Changing environment throughout the long struggle for existence has necessitated variations, and the wonder is not that no two people are alike but that heredity with all its factors should produce men with

structures, features and habits sufficiently similar to enable them to be classified into races.

ORIGIN OF HEAD.

The primary origin[6] of the skull has been an interesting problem in the structure of vertebrates, whether it was from an independent origin or whether its parts represent modifications of spinal vertebra. The vertebral theory of Goethe and Oaken was generally accepted until the middle of last century and still has many adherents. The skull of mammals would indicate an origin from reptile-like ancestors, as shown by a closer relationship between the cranial and visceral regions than is shown in lower vertebrates. In mammals the maxillary and palatopterygoid regions are firmly attached to the cranium, and quoting Cunningham[6]: "the higher we pass in the mammalian series, the more does the face come to lie below instead of in front of the cranium, the facial skeleton becoming proportionately smaller, contrasted with the large cranial portion of the skull, and in the reduction in the angle between the basi-cranial and the vertebral axis being carried further than in birds."

BRAIN.

The early condition of the neopallium[12] or cerebrum in fetal man represents that of the adult fish, later as it grows farther back it represents that of higher vertebrates, amphibians and reptiles. Finally it covers the cerebellum, as in mammals and in man. Thus we see that the pallium, as it develops in man, passes successively through the various stages represented in adult forms of different vertebrates from the fish to the mammalian types.

The human brain is larger than that of any other primate, but in size of head compared to that of trunk, man's head is smaller than primates'. The relative size of head, especially the brain, of all primates diminishes with growth. Comparing[30] the average diameter of head to length of trunk, man shows at birth an index of 57, and in the adult 31. Some primates even surpass these figures, the newborn gibbon and the orang each showing an index of 61, and the spider monkey 56. In adult life the cebus appella has the distinction of exceeding man by 8 units.

FACE AND CRANIUM.

It is a fair inference that during arboreal life the emancipation[19] of the fore limbs into hands, together with alteration of environment and habits, were the principal factors causing a recession of the snout and jaws and a reduction of the dental series, and this recession of the snout is correlated with an increase in the size of the brain. The head or skull may be divided into two general parts, the cranial and the visceral parts, the former containing the brain and the latter the part concerned in catching and masticating food. In most mammals the visceral part of the head greatly preponderates that of the cranial part. During arboreal life, even in the lowest arboreal animals, this proportion is greatly reduced, becomes even more reduced in the primates, still more in the anthropoids, and in man the cranial portion predominates.

This tendency to inverse proportion of these parts is further attested by the vascular systems supplying the two parts. In man the internal carotid artery and internal jugular vein are far greater in size than are the external carotid and external jugular, while the reverse is true in all mammals—in fact, all animals below the primates. Correlated with this tendency to inverse porportion in mass and size of these parts is the gradual change in their relative position, the face occupying a place more nearly underneath the skull, as seen in all primates. Accompanying this is the forward migration of the eyes from the sides to the front of the head, to parallelism of their visual axes and finally a complete separation of the orbits from the temporal fossæ by a filling in of the frontomalar region by cartilage and bone, as is seen in some lemurs, all monkeys, anthropoid apes and man.

In vertebrates the axis of the head lies practically along the same axis as that of the vertical column, the basocranial axis being almost a continuation of that of the vertebral axis, as we ascend in the animal scale this angle becoming smaller. There is a shifting of the position of the occipital condyles[34] forward. In the dog the spinal column is attached to the posterior portion of the skull; in the baboon it is considerably advanced forward; in the monkey more so, and in man it is placed practically under the center of gravity of the head. It

is fair to suppose that if there is a continuation of the recession of the face and a progression of the cranium, this forward shifting of the condyles will, or may have already, ceased, and a retrograde shifting take place, assuming, of course, that the shifting of the condyles has been influenced by the weight of the head. In lower animals the head is supported not only by the cervical vertebræ but is held upward by the large muscles attached to the occipital protuberance and occipital bone, which give the animal the appearance of a very thick neck. In man these msucles are very much reduced in size, as is evidenced by the relative size of the ligamentum nuchæ.

THE NASAL REGION.

There is a progressive tilting forward of the prepituitary plane, or the base of the frontal fossa, of the skull from its upward and forward position in mammals, more forward in the Simian, to the horizontal position in the highest type of man. This accompanies or is the result of the progressive forebrain pushing forward over the retrogressive nose and receding alveolar arches. In the meantime the parts lying between these two fixed planes, the frontal base above and the roof of the mouth below, have suffered in both morphology and function. The septum, composed of thin vertical laminæ of bone and cartilage, often fails to fulfill the enforced demands of accommodating its height to the practically unyielding roof and floor and, following the line of least resistance buckles, with the result of various deflections, or the triangular cartilage may find less resistance in sliding down alongside the nasal spine or over the vomer, in either case at the expense of ventilation and nasal and sinus obstruction. There, of course, may be other causes for some of these deflections, such as injuries of the septum at birth, blows, etc., but even these may act as the exciting or initial step favoring a pre-existing tendency to an inadequate space for a normal straight septal development. Occasionally a greater development of the vomer compared to that of the hard palate may cause its resistance to preponderate and consequent giving way of the intermaxillary (palate) suture, resulting in a descending of the vomer downward through the hard palate, as evidenced by a median ridge in the center of the hard palate.

MUSCLES OF FACE.

The facial muscles of the typical mammals correspond with those of man, and are also innervated by the seventh nerve. Gregory[13] believes that the first facial muscles crept forward underneath the skin, dragging the seventh nerve forward with them. A similar example is shown by the diaphragm, which originated in the neck and descended, dragging the vagus with it. In remote reptiles only the platysma and colli muscles were found and were innervated by the seventh nerve which, emerging from its foramen, passed downward or caudalward.

Darwin[7] mentions the fact that apes use the facial muscles much as children do, and pointed out the auxillary action of the facial muscles in coordination with hand movements, as shown in the effort of playing an instrument or sharpening a pencil. The child plays with his mouth. The trained chimpanzee shows similar coordination in the motion of his lips, while trying to thread a needle.

MOUTH.

In the course of evolution the mouth is the oldest part of the face.[13] Some of the lowest forms of one-celled animals show a face leading up to a mouth which opens into a cavity serving as a stomach. The purpose of a face is to direct the mouth toward food. The anemone has a mouth surrounded by tentacles. Worms have a concentration of nerve tissue, or rudimentary eyes, presumably for directing the mouth toward food. They have a kind of head and a tail. Some have tubercles with hooks about the mouth, for pulling food toward the mouth.

In some insects we find a tough skin about the head, becoming modified into a jaw, which is the next important part of the head. In the grasshopper we find this hard skin forming a face for the purpose of protecting the mouth, jaws and sense organs.

The shark has the first vertebrate face of typical form, showing the essential characteristics of the face of mammals—eyes, nostrils, mouth, lips, teeth, tongue, and a face covered with a tough skin, its face pointing straight forward, its head at the front end of its backbone, and its fins, muscles and general

contour well adapted for bringing its mouth in contact with its food, and eyes and nose in best position for guiding its actions.

TEETH.

The evolution of the face is correlated with that of the snout and jaw, and these in turn with the function of mastication, and with the quality and quantity of food. Without change of food there would have been no change in function, and consequently no change in morphology. But with development of the forearm and hand during arboreal life the task of grasping and crushing and killing with the jaws was relegated to the hand, stone and club. Heretofore the teeth were large, molars massive, increasing in size from before backward, the incisors sharp, the canines long and piercing. Interspaces existed between the teeth and between the series of teeth. After this change of function, the number and size of teeth decreased, the molars were less massive, and diminished in size from before backward, and showed tendency to elimination. The intervals between both teeth and series were reduced until man now has the closest dentition of all primates. Moreover, the alveolar process has become shrunken and the teeth intrusive.

Prognathism,[15] according to Hrdlicka, is an ancestral and not an abnormal condition; it is contingent on the length of the dental arches, size of teeth, and on the breadth of the ascending rami; under normal conditions it has nothing to do with malocclusions of the teeth.

A well-known biologist has predicted that man is becoming a chinless and toothless aristocrat.

MAMMALIAN DENTITION.

Mammalian dentition in its highest development, as in the horse, has the following formula: Incisors 3/3, cuspids 1/1, premolars 4/4, molars 3/3. In man one incisor and two premolars are wanting. It is probable that the second incisor and the first and second or first and third premolars have been suppressed. The dentition of the lower races of man differs from that of the higher in that the dental arches are squared in front, teeth larger, more regular, the canines stronger, wisdom teeth better developed, and the cusps on the molars more perfect in

lower than in the more civilized races. Compared with that of the European teeth, the savage has a perfect set of teeth (Tomes). The relative size of the cheek teeth of the various races was estimated by Flower by the proportion of the distance from the anterior portion of the first premolar to the posterior portion of the wisdom tooth compared to the distance from the foramen magnum to the nasofrontal suture (the basinasal length).

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EAR.

As a rule, the outer ear grows[30] faster than the head. In the gibbon the index (size of ear to that of head) is increased from 1.7 in the fetus of 21 mm. (crown-rump length) to 9.9 in the newborn, to 113.6 in adult. In man the ratio averages 1.3 in the fetus of 9 weeks, 5.9 at birth, but diminishes to 4.7 in adults.

EYE.

Both in man and the other primates the eyes move relatively closer together during growth. The head of the human fetus is quite similar to that of other primates and not very unlike that of other vertebrates, generally speaking. The visual axes in early fetal life are always opposite, presenting a physiognomy more birdlike or fishlike than human, but they constantly move forward to that approaching parallelism at birth. Accompanying this forward migration of the visual axes through 90°, from opposite to parallel, is a corresponding shifting of the visual fields, from laterally placed monocular fields, to superimposed binocular fields, with developed maculæ and binocular fixation.

This shifting of the orbits, visual axes, and fields forward during ontogenetic development is one of the most convincing proofs of our phylogenetic origin and of the validity of Haeckel's theory, and I am the more convinced that many cases of exophoria and exotropia are of phylogenetic origin representing reversion.

The degree of divergence of the visual axes in various animals was estimated by Lindsay Johnson.[20] The greatest is in hares (considered as having complete panoramic vision), each optic axis diverging 85°. The amount of divergence among carnivora is the least in the cat and lion, each having less than 10°. According to Jones,[19] this ontogenetic migration of the visual axes toward parallelism is in the interest of binocular single vision, and since ontogeny is a condensed recapitulation of phylogeny, he notes that in the human embryo the optical vesicles are at first placed opposite each other, at 3 months they have moved forward to 45° from the median plane, and become parallel at birth. He attributes this forward position of eyes as a direct result of a recession of the snout: "The two eyes are turned to the front as the elongated muzzle shrinks between them." While this anatomic factor may be an important one, there are no doubt others equally important in this shifting; for example, the tendency to binocular single vision and binocular fixation and the emancipation of the forearms as a result of arboreal life.

That ontogeny repeats phylogeny, that individual development of man repeats the evolutionary history of the race, is well shown by the development of the human nasal cavity, exemplifying the condition found in vertebrates. At the fourth week of the fetal life the conditions are similar to that found in fishes, at the sixth week a nasal cavity is formed somewhat like that in lung fishes. By the seventh week the primitive nasal cavity has enlarged and communicates with the mouth as in amphibians, and the mammalian condition is reached by the third month, when the roof of the mouth is complete.

FACE EVOLUTION.

There has been probably no greater evolution, no greater or varied changes in metabolic forces in man's organism than that of the head, and especially that of the face. Many reasons have contributed to this. The face contains organs whose functions are most important to the welfare and life of the organism. It enters into the formation of and supports structures concerned in mastication, defense and offense, alimentation, nutrition, respiration, and contains the organs of special

sense. In lower forms, especially the mammalia, a long and large snout was necessary in order to accommodate all these functions. Its size, mass and position are a protection to the brain and less protected viscera. The human face differs most essentially from that of the mammalia in the shortening of his snout, and while all organs of the face and all tissues, including bone, cartilage and blood vessels, have been affected, no one structure has figured so extensively in the morphologic changes contributing to the present characteristic shape of the human face as has the superior maxilla,[31] and for the important reason that this bone is the largest of all the bones of the face except the inferior maxilla as a whole, and each bone assists in the formation of three cavities, roof of mouth, floor and outer wall of nose and floor of orbit, and enters into the formation of two fossæ, the zygomatic and sphenomaxillary. The close proximity of the maxilla to the many sense organs and its participation in the formation of their supporting structures are important factors in the process of their recession, so manifest in the characteristic difference in physiognomy of mammals and man.

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DISCUSSION.

DR. JOHN M. INGERSOLL, Indianapolis: There is one part of the paper which I shall choose for my discussion: that is the development of the brain and the receding of the nose into the head. In general, the dog's head shows a rather distinct development for the sense of smell. They have a very intricate and wonderfully developed set of turbinals. The frontal sinus and the ethmoid are grouped together. They also have large openings and olfactory turbinal tissue in them. The maxillary sinus has a large opening. One of the spurs of the inferior turbinal goes from the outer cell to the maxillary sinus. As we ascend in the scale one of the characteristic modes of development of the head is the building forward of the forebrain. The development of the forebrain increases the part of the brain that does the thinking. This development pushes the forehead forward and the tissues of the sinuses disappear. In the higher apes the anterior wall of the sphenoid cell changes its part of the turbinal bone, and as the forebrain develops man loses the acute olfactory sense of the animal, who depends on the use of smell for its food. The turbinals degenerate in man and the cavities, shut off, leave a small opening. I believe the accessory cavities are purely rudimentary structures and more open to attack than a functionating structure. The forepart of the brain building out over the nose accounts for the change of the morphology of the face. The whole change is due to development of the brain, rather than to change in features. The brain predominates and the nose becomes a degenerating structure. The nose lies under the brain instead of in front of it. That development is one of the factors in the irregularity of the nasal septum. I have never seen irregularity of the septum in the mammalian skull among lower animals. In man you have the weight pushing down from above, and the septum, that cannot adapt itself to this added weight, must become curved.

DR. H. H. BRIGGS (closing): I know that much of this work is in the speculative stage, and far from what seems to be practical, but it is along a line in which we are all deeply interested. Why have we the overhanging forehead, the receding chin, the contracted jaws and receding alveolar processes? Why

the sinuses, and what is their function? Why are we losing the sense of smell? Why have we advanced from a panoramic monocular vision to overlapping binocular fields, and later to a binocular single field with fusing of images? Why the association of convergence and accommodation? These and many other morphologic changes and functions can only be known through a study of evolution, and I am convinced that many of our problems in rhinology have been handed down to us through variations and environment since life began.

XCIII.

CASE REPORTS FROM THE ROSS HALL SKILLERN CLINIC OF THE UNIVERSITY OF PENNSYLVANIA.

By Samuel R. Skillern, Jr., M. D.,

Philadelphia.

The object of these communications is to give a true, unbiased report of certain interesting cases seen and treated in the Skillern Clinic of the Graduate School of the University of Pennsylvania. We are reporting these cases not only for the benefit of those men who do not have the opportunity to observe such a variety of clinical material but also for the information and improvement of the department as well. All cases coming into this clinic must first report to the outpatient department, where they are examined and advised as to the proper treatment. If an operation is found to be necessary, they are sent to the hospital with the findings and recommendations. After discharge from the hospital following operation, they are advised to return to the outpatient department for their further treatment. For convenience in reporting, all patients are to be divided into two classes—i. e., the outpateint department and the hospital or operating room. This latter will include the private patients as well. Dr. Frederick M. Strouse, assistant professor of laryngology and chief of the outpatient department, assigns certain men of the staff to special work, such as the treatment of maxillary sinusitis for a definite period of time, a specified treatment being used for a period of weeks and the results reported. The services then being changed, another member of the staff takes over the maxillary cases, using a different form of treatment for a like period. By this manner we hope to find the most efficient treatment for not only all sinus affections but for other nose and throat conditions as well. As we have a routine for the commoner cases, the first case of each class, such as a tonsillectomy, will be described in detail. Thereafter it will be omitted, unless some point of

interest arises in a particular case. When such cases arise they will be reported in detail, emphasizing the unusual occurrence or untoward happening. Each case will be followed by a criticism with particular attention to any errors in judgment, operative technic, etc., which may have been made by the attending surgeon, together with the opinions as to what form of treatment might have proven more effectual in that particular case. It will be the object in reporting these cases to make them short and concise and yet give sufficient clinical history and findings to make them comprehensive and we hope interesting.

Tonsillectomies being in preponderance, we will give the Skillern routine treatment for tonsillectomies and adenectomies, in children.

The case, having been brought in by a parent or social service worker to the outpatient department, is examined and given a date for admittance to the hospital. A prescription for calomel, gr. 1, soda bicarb. gr. X, made into tablets No. X, and the following directions are given to the adult: Starting at 5 o'clock the day before the operation, give the child one tablet every half hour until all ten are taken. The following morning, before breakfast, enough citrate of magnesia to get a watery stool. A light breakfast and nothing by mouth after breakfast. Bring the patient in to the hospital at 10 o'clock. This allows the intern sufficient time to make a complete physical examination and urinalysis. If the child's citrate has not been effectual a soapsuds enema is given. At 2 o'clock the child is sent to the operating room on a stretcher. Gas-oxygen induction is given by a professional anesthetist to all children of five years or older. Ether, by the open drop method, is then administered until complete relaxation is obtained. All anemic or poorly developed children and those under five years of age are anesthetized by the open drop method. When complete relaxation is obtained the patient is transferred to the operating table, draped with sterile sheet, towels, etc., and the electrically lighted mouth gag inserted. (This is a Skillern modification of the Jennings lock tight gag.) The clinic prefers this type of illumination to all others, as the area is continually bathed in light, giving the assistant a chance to work while the operator is getting another instrument from his tray, or talking.

After a trial (comparative trial) of all the methods of removing tonsils we have found the best all-round results are obtained by the La Force method. The entire tonsil, including the so-called capsule, is removed at a single operation. There is a minimum of bleeding at the time of the operation, and we have never had a postoperative hemorrhage that required ligation or sutures. Inquiry among the staff has failed to reveal a single instance (in twelve years) that the operator has been recalled to check a hemorrhage following a La Force tonsillectomy when it has been complete. The La Force tonsillectomy, in our hands, gives the minimum amount of trauma to the pillars and discomfort to the patient, and the shortest convalescence.

I shall give my own daughter, aged three years, as an example. Following an attack of acidosis with a convulsion, her tonsils and adenoids were removed two weeks later. The night following the operation she was restless and complained of her throat until midnight, when she went to sleep. The following noon she was taken home, and, as it was a warm, sunshiny fall day, and as she professed to be feeling fine, she was allowed to play outdoors until sundown. That evening she ate her usual supper and went to bed and slept soundly until the following morning. At breakfast she said once that her throat hurt her, but that was the last complaint that she made. The eighth day her throat had lost all of the white membrane and appeared normal.

After the La Force is applied and the tonsil cut by the sharp blade, we allow the heavy hemostatic blade to remain for three minutes to allow coagulation to occur in the cut vessels. In this way the amount of bleeding is generally insignificant—in fact, it is the rule that the fossæ are perfectly dry. A great deal depends upon the handling of the instrument as to the amount of bleeding. If during the three minutes the clamp is on, the instrument is moved about, or careless rough removal of the instrument disturbs the clot in the cut vessels, there will always be bleeding and generally in proportion to the rough handling. After the removal and inspection of the tonsils and a careful inspection of the fossæ to see that all tonsil tissue is removed, the adenoids are removed by the La Force adenotome. A small sized adenoid curette is then used to remove any hypertrophied

adenoid tissue from the sides of the nasopharynx and the area inspected.

In some cases, especially in adults, there is what is called an extracapsular tonsil found just below the faucial tonsil. This is a piece of lymphoid tissue connecting the lingual tonsil with the faucial. We remove this with the wire snare, as we have found that after the removal of the tonsils Nature, in trying to fill the fossæ, will cause hypertrophy of this lymphoid tissue, occasionally to the size of the original tonsil. We believe it is this hypertrophied tissue, or the failure to remove all the tonsillar tissue, with its hypertrophy, that has given the public the idea that the tonsils recur after their removal.

A final inspection of the throat for any bleeding area, as we make it a point to have all bleeding stopped before the patient is permitted to leave the operating table. The patient is placed on the stretcher face down so that anything coming into the mouth will not be inhaled, covered with a hot blanket and sent to bed, to be placed in the same prone position until fully out of the anesthetic. An hour later water is given if desired, to be followed by a liquid diet, returning to a normal diet as the child is able to swallow. The patient is discharged the following day with instructions to return for examination of throat in ten days.

CASE NUMBER 1.

Diagnosis: Infected tonsils, deflected septum, right hyperplastic ethmoiditis and chronic otitis media.

Operator, S. R. S. R. C., male 38. Submucus resection, right middle turbinectomy, left paracentesis. First seen January 7, 1927. Gave history of vague aches and pains in limbs, loss of weight and general debility. Examination revealed infected buried cryptic tonsils, a badly deflected septum with hyperplastic ethmoiditis (right side) and a chronic otitis media.

Tonsillectomy by La Force method was followed by an amelioration of symptoms for three months. With a return of symptoms a submucous resection and turbinectomy was advised. Great difficulty was encountered in separating the mucous membrane and periosteum on the right side, due to a thinning out of the mucous membrane and numerous adhesions high on the perpendicular plate and in the deep V at the junction

of the perpendicular plate and vomer. A good deal of mucous membrane was destroyed on the right side, but as the left mucous membrane was intact a good result was obtained. The right middle turbinate, which had undergone true hypertrophy, was removed to allow for ventilation and drainage of the ethmoid cells and frontal.

As there was a swelling and pulsation of the right tympanic membrane it was incised for drainage.

Patient seen the latter part of July, stating he was feeling fine.

Notation.—Following the removal of this patient's tonsils there was a marked exaggeration in all of his symptoms, requiring his confinement to bed for ten days, his family physician stating he had a typical attack of influenza. It is a question in my mind whether the removal of his tonsils was the cause of this lighting up of the latent infection in his sinuses and middle ear. I believe in a similar case it would be advisable to do the intranasal work and allow the removal of the tonsils at a later period.

CASE NUMBER 2.

Operator, R. H. S. Assistants, S. R. S. and student.

Female, age 50 years. Duration, seven years six months. First seen September, 1919. Gave history of influenza followed by acute rhinitis April, 1919. Continuous neuralgic pains in left side of face with a bloody discharge from nose, most profuse in the mornings.

Needle puncture of left maxillary; clear secretion, followed by an unusual quantity of blood. Maxillary lavage every other day with great improvement in sixty days.

March 1, 1920, following cold, patient had postnasal bloody discharge, swollen face and numerous fever blisters on lips. Relieved by irrigation of maxillary; in July, pus and blood as postnasal discharge. August, needle puncture of right maxillary showed bloody return of fluid. September, thick yellow pus in both maxillaries.

Irrigation of maxillary sinuses would greatly lessen the amount of the discharge and make patient comfortable for varying lengths of time, but nothing seemed to give permanent relief nor could the discharge be entirely controlled.

The following solutions were used in the sinuses for varying lengths of time:

Irrigations with warm normal saline solution.

Irrigation with iced tap water, later followed by filling the sinus cavity with alcohol, from 10 to 90 per cent; phenol, 10 per cent in glycerin; argyrol, up to 50 per cent; silvol and neosilvol in various strengths, finally silver nitrate, starting at 5 per cent and increasing up to 30 per cent.

Any of these solutions seemed to control the amount of pustular discharge, but as soon as treatment was stopped the discharge returned in full force. Vaccines, both stock and autogenous, were tried, also the intravenous injection of triple distilled water, without result. We thought for a time that the irrigation of the sinuses, with the combined injection of vaccines and triple distilled water, had the condition relieved, as she was without noticeable discharge for several weeks, but the first cold in her head caused its return in full force. Operation had been suggested numerous times, but was refused, until malignancy was suggested.

Operation: Double Caldwell-Luc.

The sinuses were lined with a tough, leathery-like membrane of fibrous tissue, with polypoid degeneration and free fetid pus.

Notation.—This case refused operation for so long a time that such a marked chronicity occurred that the operation failed to relieve all discharge, as usually occurs. The discharge is of a different chacracter and is gradually diminishing in quantity. At the present time, six months after operation, there is a thin, watery pustular postnasal discharge in the mornings, which we hope will entirely disappear under proper treatment.

Since this was written the discharge has practically disappeared.

CASE NUMBER 3.

Operator, S. R. S. Assistants, H. Laessle and student.

Female, age 37. Duration, 20 years. Referred by Dr. Leboutillier, March 22, 1927, with history of nasal discharge, periodic headaches often lasting for several days, sharp shooting pains in the fact and head, general toxemia, constipation, general debility and neurasthenia.

Had been under the care of different physicians for the last five years with the following operations: Tonsillectomy and partial right-sided ethmoidectomy in 1925; submucous resection, appendectomy and a ventral fixation of the uterus, 1926.

Three series of X-ray plates gave negative readings of the sinuses. The maxillary sinuses had never been needled.

Examination: Traces of pus in both sides of nose; mucous membrane swollen and congested and appeared to be very tender. Some difficulty in shrinkage due to edema and hypersensitiveness of patient.

Right side: Anterior end of middle turbinate has been removed; pus seen on the posterior end of middle turbinate.

Left side: Turbinates intact; pus seen in back of middle turbinate; inferior turbinate swollen and boggy.

Transillumination: Both frontals and maxillary sinuses thought to be clear; ethmoid on right side much darker than its fellow.

The pain complained of by the patient was chiefly on the left side of the face, so that the left maxillary was irrigated first; a clear return of the saline solution was obtained. Due to the patient's extreme weakness and her highly nervous condition it was thought best to continue the examination at a later date.

April 8th, the right maxillary was needled and irrigated; the returning fluid contained a very foul smelling, thin, milky white pus that mixed with the saline solution. The left was negative.

After an hour's wait the patient was again examined and a thin, sticky, white pus was seen under the right middle turbinate, which reappeared upon wiping it away. Pus of the same character was also seen coming down over the posterior end of the turbinate.

A diagnosis of chronic maxillary sinusitis with an ethmoid and sphenoid sinusitis of the right side, with possible left posterior ethmoiditis or sphenoiditis.

Treatments were advised until the patient's general condition improved and to see if the irrigations would control the pus in the right maxillary.

One point of interest was noted in attempting to irrigate the right maxillary. If a gentle continuous pressure was used the return flow was normal, but as soon as the pressure was increased the return flow would suddenly stop and the patient

cry out with pain and say her cheek was bursting. A slight suction on the syringe, followed by gentle pressure, would reestablish the flow.

Operation.—April 20th, under local anesthesia, the remaining portion of the middle turbinate and the ethmoid cells were removed, and the anterior wall of the sphenoid bitten away. Several small polyps were found in the ethmoid cells. The left middle turbinate was shrunken and refracted against the lateral nasal wall and the left sphenoid opened. Both sphenoids contained a thin, straw-colored fluid which past experience and laboratory tests have proved to be highly toxic.

The following day, after irrigation of the operated fields, a general anesthetic was given for the opening of the right maxillary sinus. The wall of the canine fossæ was very thin and easily broken through; the sinus contained foul-smelling, thin pus, degenerated mucous membrane and polypoid tissue which was undergoing degeneration. The cavity was lined with a very tough fibrous membrane which had attained the thickness of thin cardboard; this was very adherent to the bone. It was impossible to curette this membranous lining, as the curette would not take hold, and considerable difficulty was encountered in removing all of it.

Hanging from the roof of the sinus was a large, pendulous polyp, which would explain the difficulty encountered in the irrigations, as it was the pushing upward of this polyp by the fluid, jamming it against the ostium, that caused the sudden cutting off of the return flow. The more pressure used, the tighter the polyp was pushed against the ostium, where a slight suction would pull the polyp away from this wall and allow the reestablishment of the return flow.

A large counter opening was made into the nose, extending from the floor of the nose to the insertion of the inferior turbinate and backward the length of the turbinate. The sinus and nasal cavity lightly packed with iodoform gauze and the canine wound closed with one stitch. The nasal packing was removed on the second day, the sinus packing on the fourth and the patient discharged on the seventh.

Postoperative treatment consisted of irrigations of the nose and sinus, with warm normal saline solution and an oil spray to cover the mucous membrane.

May 14th, swelling of the cheek has almost entirely disappeared and patient states she is greatly improved.

September 26th. No evidence of pus in the nasal cavities or in the nasopharynx. Patient states all of her former symptoms have disappeared with the exception of an occasional attack of indigestion. She has gained 25 pounds and looks to be in excellent health.

Notation.—I cannot express myself too strongly as to the fallacy of depending upon the X-ray plates for a diagnosis in sinusitis. A negative finding, in the opinion of the Skillern Clinic, means nothing. We have seen too many cases of sinusitis, sent to the roentgenologist for plates to obtain the size of the sinuses, sent back with a negative report of sinusitis. Neither do we accept a positive report when there are no nasal findings. How often a case of maxillary sinusitis is sent to the X-ray rooms, to have a return of the diagnosis sheet "Maxillary and frontal sinuses clear, ethmoids cloudy." Had the rhinologist who first saw this case made a needle puncture and not depended upon the negative X-ray plates for his diagnosis he would have, in all probability, saved this case a great deal of suffering, to say nothing of expense.

A hard and fast rule of our clinic is in all sinus cases, needle and irrigate the maxillary sinuses.

CASE NUMBER 4.

Operator, S. R. S. Assistants, Dr. Laessle and intern.

Miss P., age 28 years. Duration, 12 years. First seen February 21, 1925.

History: French; was always a strong, healthy girl until captured by the German Army in 1914. Due to unsanitary living in a damp cellar with fifty other French captives contracted influenza in 1915, was desperately ill for several months. Severe attack of tonsillitis and sinusitis in 1916. Arrived in United States in 1919 and was under different physicians' care until 1925, when she was referred by Dr. T. LeBoutillier for examination of sinuses and throat.

History: Intermittent nasal discharge of thin, foul-smelling pus; periodic attacks of toxemia with headache and gastritis (with nausea and vomiting); poor memory and lassitude.

Examination: Swelling and edema of entire Schneiderian membrane; breath very fetid. Throat congested; tonsils of the hypertrophied, cryptic type; pus exuding from all crypts upon slight pressure.

After shrinkage: Turbinates hyperplastic with true hypertrophy of right; enlarged bullæ ethmoidalis on right side, with generalized inflammation of the ethmoid region. Needle puncture of the maxillaries gave a foul-smelling, milky white discharge that mixed with the normal saline that was used as a wash. The odor from this irrigation was so bad that it was necessary to open the windows of my office and sprinkle ammonia about to kill the odor before seeing the next patient.

As Miss P. was a school teacher she could not spare the time for an operation, so that local treatments were to be carried on until the school term had finished. I make this statement, as a new treatment was tried (the intravenous injection of triple distilled water every fifth day along with the triweekly irrigations of the maxillaries with normal saline solution). Before the school term had finished, in June, her sinusitis was to all appearances cured, as the washings from the maxillaries returned clear and her ethmoids appeared to be in a healthy condition and, best of all, all of her symptoms had disappeared.

A tonsillectomy by the La Force method was done June 20th, hoping to prevent any further contamination of the sinuses from this chronic source of infection.

Irrigation of the maxillaries, June 24th, July 29th, August 5th and 18th, October 3d and 24th and November 15th were negative. These washings were done merely as a check on the former findings, as there had not been any symptoms of sinusitis since early in June.

As I had apparently cured three other cases of maxillary sinusitis with this treatment, I thought I had discovered a new treatment for sinus infections that would do away with operations of the radical type. I was doomed to disappointment, as November 24th the patient returned with the history of acute coryza, followed by the discharge of pus and return of sinus symptoms. Irrigation showed pus in the right maxillary, following a second infection a month later; both maxillaries showed pus in the washings.

Irrigations and intravenous injections would control these attacks from one to three weeks, patient being free of symptoms, but each time the vitality was lowered there would be a recurrence of pus in the antrums. In all, eighty-seven irrigations were done, using normal saline, followed with a series of installations of ice water, mercurochrome, ichtholdin, alcohol in different strengths, silver nitrate, argyrol, alkalol, zonite, collene and silvol solution. In my opinion, the good results were obtained by the mechanical cleansing more than by any drug instillation, although, as the operative findings will show, there was very little pathology found in the sinuses.

Operation.—Double Caldwell-Luc.

Of the two antrums the right had always been the one to show pus first whenever the patient's vitality had been lowered, so that this sinus was opened first. I was rather surprised not to find free pus present, as three days previous to the operation a large, globular mass of yellow pus had come away with the washing of this sinus. There was a small amount of polypoid tissue found at the base and high up in the superior angle; otherwise the mucosa was to all appearances in a healthy condition.

When the left antrum was explored the mucous membrane appeared to be perfectly healthy except for a small area the size of a dime on the nasal wall, high up near the angle and around the natural ostium. The usual counter openings were made beneath the inferior turbinate, and as the bone had bled rather freely the sinuses were packed lightly with iodoform gauze.

During the night the packing in the left nasal cavity slipped back into the nasopharynx, causing the patient to cough. The house surgeon, instead of pulling the packing forward through the nose before cutting the loose end, cut the hanging gauze off through the mouth, then attempted to pack it back in the nose, with the result that he pushed the entire piece into the antrum. He then reported to me that he had removed the gauze from the left antrum. The following day the packing was removed from the right sinus and the nose irrigated with normal saline solution.

The third postoperative day the patient complained of an increasing foul odor in the left side. There was a markedly increased swelling on that side and the patient appeared toxic. Examination showed a purulent discharge from under the inferior turbinate and the gingival incision showed a small perforation which was also discharging. Lavage and exploration of the sinus through the nasal opening revealed a piece of packing, about four inches long, which was removed. This had caused a necrosis of the mucous membrane, as shown by the rhinoscope, and required several irrigations and the filling of the sinus with dioxygen before all odor and discharge was relieved.

Patient seen two months later, greatly improved in looks and general health, although she still has a slight purulent discharge from the left ethmoid.

Note.—Although this patient gave all of the classic symptoms of a maxillary sinusitis, the findings at the time of operation were not those of a typical antral disease, so that the question arises in my mind as to whether or not the antrums were not merely acting as reservoirs for the collection of the ethmoid pus. If this is the case, the operation was unnecessary and an error was made in not removing the ethmoids before doing such radical work as a Caldwell-Luc. I shall watch this patient with great interest during the winter months, as the two years that I have been in attendance the discharge has been at its worst during the winter, with little or no discharge in summer.

CASES OTHER THAN TONSIL CASES.

(A) Retrobulbar neuritis in male. Double ethmoidectomy showed hyperplastic ethmoiditis of post. cells, no pus but thin, watery like secretion. Double sphenoidectomy showed both sphenoids a pearly white. M. M. Op. S. R. S.

E. L. Killian, in 1918. Pain in frontal; large bullæ opened by S. R. S. Frontal rasped by R. H. S.

Mrs. B., age 33. Secondary operation: Caldwell-Luc. The previous surgeon had made an opening through the canine fossæ about the size of a small lima bean; no drainage into nose. Operation: Canine opening enlarged; considerable mucopus in cavity; small amount of polypoid tissue on roof and

floor. Large counter opening with flap made under inferior turbinate. Canine wound closed with one stitch. Criticism: Opening of max. seldom cures without counter opening into nose.

Clinical Cases.—Male, age 24. Submucous resection for occlusion. Operation by P. G. student. Due to numerous adhesions and sharp angles in deflection this was a difficult case. Two large perforations were made through M. M. As these perforations were through both flaps of the mucous membrane they will in all probability be permanent. Otherwise good result. Supervised by S. R. S.

Male, age 36. Submucous resection for occlusion. Operation by P. G. student. High deflection with large spur at base. Mucous membrane separated easily. No perforations; should have good result. Supervised by Dr. Price.

Mrs. P. Op., S. R. S. Age, 42. Continuous pains in head for the last two years, mostly over frontal sinuses; buzzing noises in ears; postnasal discharge; nose always feels dry. Provisional diagnosis: Chronic hyperplastic ethmoidalis posticus. Probable low grade frontal sinusitis; chronic catarrhal otitis media. X-rays show absence of frontal sinuses, ethmoids thickened and hazy, remaining sinuses clear. Ethmoid cells very difficult to remove, due to a previous partial ethmoidectomy with resultant scar tissue; thickening of remaining bony tissue and obliteration of usual landmarks. The ethmoid cells extended upoward and outward farther than normal, encroaching upon the frontal area and above and to the outer side of the sphenoids. There were two large ethmoid cells directly above the sphenoids, which were opened and found diseased; also a large bullæ cell on the right side. The sphenoids were normal.

PURULENT ETHMOIDS AND SPHENOIDS.

Operator, S. R. S. May 13th.

Neurotic Jewess, age 42 years. Duration, two years. First seen May 3, 1927, with history: "Mine head hurts all the time and such noises in mine head I cannot stand. Please, Doctor, make me an operation, as I am so nervous." Pain mostly over frontal area, dull aching in character. Buzzing noises in head: postnasal discharge. Tonsillectomy and partial ethmoidectomy on right side in 1925.

Examination: Large hypertrophied end of middle turbinate; hyperplasia and true hypertrophy of posterior ethmoid cells; large bullæ and uncinate cells on right side; hyperplastic ethmoiditis on left side.

Operation: Ethmoidectomy and sphenoidectomy (double). The bony walls of the ethmoid cells were greatly thickened and of ivory-like consistency. There was a large spheno-ethmoid cell on the right side that was infected, also an infection of the bullæ and uncinate cells. The entire left ethmoid was infected. Both sphenoids were normal. The X-ray showed an absence of frontal sinuses, but there was a large agger nasi cell and pre-ethmoid recess which was very difficult to open, due chiefly to the hardness and thickness of the bone.

May 20th. Headaches greatly improved; complains of fullness in right ear when nose is blown. Buzzing in ears slightly better.

Notation.—This was a case in which the roentgen ray examination was of great assistance. This patient gave a rather classical picture of chronic frontal sinusitis. The pains were more or less confined to the frontal area; marked tenderness of the inferior wall near the inner canthus of the eye; pains most severe in mornings, often awaking patient from sleep; pains increased by jarring, blowing the nose, etc. Transillumination of frontal area was darker than normal, and with the history and findings an erroneous diagnosis of chronic frontal sinusitis could easily have been made.

The history and findings were due to the infected ethmoid and agger nasi cell.

FISTULA FROM RESECTED LACRIMAL SAC.

Operator, R. H. S.

Female, 42. Six weeks previous had resection of lacrimal sac on left side for purulent dacryocystitis. External fistula constantly discharging pus. Examination of nose showed greatly hypertrophied agger nasi on affected side. Operation: Local anesthesia (a saturated solution of cocain in adrenalin). Removal of uncinate with chisel, together with underlying cells. Anterior end of middle turbinate resected and anterior ethmoid cells exenterated. Some polypoid tissue but no pus. Fistula then curetted externally until a good counter opening was made

through the ascending process of superior maxilla into the nose. Fistula closed with two dermal sutures.

Result: Complete permanent closure.

Criticism: This case shows the futility of resecting a purulent lacrimal sac without first ascertaining the condition of the anterior ethmoid cells. If this had been done and the diseased portions of the ethmoid removed intranasally, it is quite probable that the sac would subsequently have thrown off the infection, thus obviating the necessity for its removal.

TONSILLECTOMY IN AN ADULT OF 74 YEARS, WITH CHRONIC MYOCARDITIS.

Operator, R. H. S. Assistant, R. F. R.

Male, age 74. Both tonsils small, smooth, sclerotic but infected; streptococcus hemolyticus; bad operative risk; low resistance; senility; chronic myocarditis for 20 years; heart definitely weak; during last two years senility more marked, particularly in nervous system; digestion weak. Operated on for appendicitis, 1906. During operation had cardiac failure and nearly passed away.

Despite local treatment, including radium, tonsillar infection became more virulent and cervical glands in neck, directly opposite tonsil on right side, became enlarged to about the size of a walnut, being quite hard and painful. The heart was also showing signs of imminent exhaustion. These symptoms became so grave as to demand some radical form of treatment.

Despite bad operative risk, an immediate enucleation of tonsils was decided upon by one of our foremost clinicians (Dr. Judson Daland). The patient was sent to the hospital, and 10 grs. of sodium-barbital was given at 12 noon and was repeated at 1 o'clock. Anesthesia gas-oxygen-ether sequence was taken and at 2 p. m. the removal of the tonsils was attempted by the La Force method, which failed, owing to the deeply buried tonsils. It was found necessary to use the dissection and snare method and they were removed without much trauma or loss of blood. But little general reaction followed nor was the throat particularly sore, although the uvula became very edematous. The patient was kept strictly in bed for four days, and on the fifth was allowed to sit up several times for ten-minute periods,

and finally returned home on the eighth day, considerably weakened but with all organs functionating normally, the glandular swelling along side of the neck having reduced itself to about the size of a bean.

Criticism.—This case was an important one, from many viewpoints. In the first place, he was a very prominent manufacturer and a great philanthropist, residing in Germantown, whose death would have been heralded far and near. This naturally added to the operative risk. Regarding the tonsils, while he was under local treatment, which consisted of cleansing of the crypts by blowing out with compressed air through the eustachian catheter, then washing with normal saline solution, followed by the application of 50 per cent tincture of iodin well painted over, he seemed to be doing very well, but shortly after the radium applications the tonsils began to shrink appreciably in size and it became increasingly difficult to cleanse the crypts. The glandular swelling then began to make itself manifest, so that while I am not prepared to state definitely the radium caused this untoward effect, nevertheless it would appear that this might be the case. As his expectancy of life in the natural course of events was not very great, it is probable that the local treatments, which were given twice a week for two months and then suspended for four or five, might have carried him through the balance of his life. Now, with the tonsils completely removed, it would be interesting to note the further developments, with a special reference to his heart and nervous system.

DOUBLE CHRONIC PURULENT MAXILLOETHMOIDITIS.

FOUR SEPARATE OPERATIONS.

Operator, R. H. S. October 24, 1927.

Female, age 42. Five years ago started with colds, which settled in both antra. Teeth X-rayed and five upper bicuspids and molars extracted. Some improvement, which, however, was of short duration. Submucous of septum and tonsillectomy brought no further relief.

Present condition: Pain over left eye, parietal and occipital regions. Pain not typical. Uses many handkerchiefs daily. Pus yellow and thick, nonfetid. Sense of smell lost. Marked feelings of depression. Lateral sore throat (left). Indigestion.

Examination: Ethmoids both sides hypertrophied with marked polypoid degeneration. Much yellow purulent secretion in both middle nasal fossæ. Olfactory fissures entirely occluded by swollen mucous membrane. Frontal regions not accessible. Nasopharyngoscope showed entire ethmoids diseased; sphenoids probably not infected. X-ray corroborated these findings. Slight cloudiness in lower part of both frontals. Urinalysis, albumen 1 plus.

October 25, 1927. Under local anesthesia intranasal exenteration of entire right ethmoid, beginning with the uncinate process. As complete as possible. No difficulties encountered. Convalescence uneventful; highest temperature, 99 2/5; pulse, 112.

October 28th. Intranasal exenteration of entire left ethmoid, similar to previous operation.

October 30th. Patient not so well. Temperature, 100 4/5; axilla pulse, 120; urinalysis, albumen 1 plus.

November 1st. Complains of great pain in left ear. Temperature and pulse somewhat lower.

November 2. Pain in ear worse. Examination shows congestion of tympanum. Paracentesis left with some relief. Temperature, 99 4/5; pulse, 114. Not much change in general condition. Great quantities of thick yellow pus from both nostrils; much worse on left.

November 4th. Caldwell-Luc on left side. Findings: Entire mucous lining of antrum was one mass of dark bluish pyogenic membrane, gelatinous and very friable. Cavity filled with thick yellow pus.

November 5. Some prostration. Temperature, 100½, axilla; pulse, 120. Part packing removed.

November 6th. Face began to swell; still complaining of pain in ear and down neck on left. Prostration more marked. Temperature, 99 4/5, axilla; pulse, 118.

November 7th. General condition about same. Urinalysis, albumen 4 plus.

November 8th. General condition still about same. Discharge from ear becomes purulent. Discharge from nose decidedly less. Temperature, 100 3/5 axilla; pulse, 120.

November 9th. General condition decidedly better. Discharge from nose still less. Discharge from ear greatly diminished.

Complains less of pain and general exhaustion. Expresses a desire to sit up out of bed for a while. Temperature, 98 4/5 mouth; pulse, 104. All packing removed.

November 10th. General improvement. Discharge from left side of nose now less than from the right. Ear dry.

November 11th. Better in every way. Urinalysis, albumen, faint trace.

November 21st. Caldwell-Luc; right side. Findings: Similar to left; perhaps pathology not quite so marked. Cavity filled with thick yellow-white pus. Culture, pure staphylococcus aureus and albus.

November 22d. Both sides of face considerably swollen. Left ear again breaks out and discharges thick yellow pus. Not so much reaction as with other Caldwell-Luc. Part packing removed. Temperature, 100 3/5; pulse, 122. Urinalysis, everything negative. Urine normal.

November 23d. Slept entire night with gr. x. adalin and luminal. Ear discharge almost ceased. Face considerably swollen, although patient in good spirits. Temperature 100 2/5; pulse, 120.

November 26th. Ear ceased discharging. Nasal secretion much less than at any time. Pulse and temperature almost normal. All packing removed. Patient sitting up. Still considerable deafness in both ears.

Subsequent history: Recovery uneventful except a number of local treatments were necessary before the eustachian involvement subsided.

Criticism: This case represented an unhappy combination of a very nervous and apprehensive woman coupled with a chronic bilateral purulent maxilloethmoiditis which had progressed so far as to preclude the possibility of a cure except by radical surgical methods.

There was a vague history of angina pectoris, which apparently was unfounded, but nevertheless made a marked impression upon the patient, as she had been advised under no circumstances to ever take a general anesthetic. The husband was also apprehensive on this account. It was, however, plainly apparent that the ethmoids and maxillary sinuses must be radi-

cally cleared of the chronically diseased pyogenic membranes. Therefore, despite her nervous condition it was decided to perform the ethmoid exenterations under cocain-adrenalin anesthesia and the maxillaries under gas-oxygen-ether sequence—one operation being done at a time, allowing a sufficient interval of time for recovery and healing before another being attempted.

She was extremely "touchy," even on examination, so that it was seen that the contemplated exenteration of the ethmoid under local would be, to say the least, trying. It was apparent that if she suffered much inconvenience during the first operation (ethmoid), that would probably end the case and there would be nothing further done, so thorough preparation was essential.

The exact date of operation was only made known to her on that morning, and one hour previous she was given fifteen grains of sodium-barbital, being five grains in excess of the usual dose; consequently at the time of operation she was in a quiet frame of mind, the nervousness and apprehension having practically disappeared. Anesthetization was accomplished with a supersaturated solution of cocain in pure adrenalin and applied to the entire right nasal cavity, more or less continuously for fifteen minutes. Anesthesia was perfect and the operation proceeded without pain.

The next operation (Caldwell-Luc) being done under general anesthesia, was the source of a certain amount of apprehension, due to the presumed cardiac condition. After this had passed successfully, no more objection or fear was present, and the two other procedures were accomplished without noteworthy comment.

This case is a brilliant example of one which requires patience and tact and where the old adage, "make haste slowly," must be observed. To have tried to perform all, or even two, of these operations at one time would have been tempting Providence, as her nervous system would certainly have broken down under the strain, with the result that only a portion of the work would have been accomplished. As a matter of fact, as will be seen in the notes, marked improvement did not occur until after the last operation for, with the others,

not only had she to convalesce from the surgical trauma but also from the systemic disturbance, combating the purulent collections which were continually forming in the unoperated diseased sinuses.

CHRONIC HYPERPLASTIC ETHMOIDITIS, WITH ASTHMA, REQUIRING COMPLETE RESECTION OF A LARGE PORTION OF NASAL SEPTUM.

Operator, R. H. S.

Male, 57 years. Diagnosis: chronic hyperplastic ethmoiditis with asthma. Multiple operations (200-300) for removal of polypi since 1902. Nasal passage becoming narrower and narrower. May 1, 1927, present condition entire ethmoid labyrinth, both sides, polypoid degeneration. Septal mucosa greatly thickened. Inferior turbinates show hyperplastic thickening. Both nasal passages, particularly posteriorly, so much occluded as to almost prohibit nasal breathing and to completely prevent it on lying down. In view of the repeated removal of this degenerated tissue (which must now be done every three months), it was plainly seen that something of a more radical nature was indicated. All things being considered, a septal excision (Fein method) was decided upon, on May 4th. This consisted in complete removal of all of the nasal septum, including mucosa both sides, leaving sufficient support in front for the nose and about one-half inch going into the choanæ. This threw both nasal cavities into one and made the subsequent removal of the posterior ethmoid cells, one each side, a simple matter, as one could work from the opposite nostril. Under the usual cocain-adrenalin solution, an enormously thickened septum was removed, together with sufficient polypi and polypoid tissue, to fill an ordinary wine glass.

Result, December 8, 1927. No improvement in asthma. Nasal breathing, however, tremendously improved, particularly noticeable at night. General condition better. Examination showed nares free. Some slight polypoid budding in anterior ethmoid region high up.

Criticism: This case shows the futility of trying to keep a narrow nose free from polyps after a complete hyperplastic degeneration of the ethmoids has occurred. I cannot entirely agree with Hirsch that all these cases find their genesis in the

maxillary antrum, for I believe this cavity can become secondarily affected, but certainly when it becomes filled with polyps, even though the ethmoids be as completely exenterated as it is humanly possible to do, it nevertheless remains a point from which hyperplasia will spread.

I was not able to demonstrate to my own satisfaction that this condition was present here, but we are still keeping him under observation. Considering the results, as compared with previous ones, the extensive removal of the entire nasal septum (Fein operation) was more than justified.

DISCUSSION OF CASE OF MRS. R. B. R.—CHRONIC MAXILLARY SINUSITIS—OPERATION, CALDWELL-LUC.

Answering questions asked during discussion:

The valuation of transillumination as compared to the X-ray plate?

We feel that more information is obtainable by transillumination, at the time of our examination, than from X-ray negatives taken at some other time. Personally, I have sent a number of known purulent maxillary sinus cases to the roentgenologist, with instructions to the patient to return for treatment as soon as the X-ray examination was finished. I have then irrigated these sinus cases and obtained up to an ounce of pus. The following day the report and films would be sent to me as negative. This proves what our friends, the roentgenologists, say, "Pus does not cast a shadow in all cases." The same abnormalities—i. e., thickened mucous membrane or bone—will affect both of these methods of diagnosing alike, and it is surprising to see the number of inequalities we find while transilluminating the sinuses. Given a case of sinusitis, if we find one side darker than its fellow, we needle and irrigate if it be the maxillary. If it be the frontal and we can find no evidences of pus in the nose after a thorough shrinking of the Schneiderian membrane on that side, then we refract the middle turbinate and watch for pus to appear under it.

When irrigating the maxillary sinus do we accept a negative washing as a diagnosis that this sinus is not infected?

We do not. It may be that the sinus has recently emptied itself, or the pus may be so thick and tenacious, sticking so tight-

ly to the floor of the sinus, that water will not dislodge it, or it may move about in the sinus without coming out of the ostium with the return flow of the washings. If we suspect a maxillary of infection we irrigate it three or more times at four-day intervals. If we get negative washings each time, we rule this sinus out, for the time being, or think of it as being abnormal in formation. In those cases in which the sinus has a high bony septum (or is divided into two cavities with a small opening in the partition), the fluid will not get into this pocket with sufficient force to wash it, and it may be that this pocket contains the only infected tissue. In these cases it is a good procedure to try to drain this pocket into the sinus by having the patient assume the prone posture with the infected side higher, as this favors drainage toward the ostium. Upon resuming the examination free pus will either be found in the nose or, what is more likely, a second irrigation of the sinus will bring it to light.

I have heard general surgeons say that the reason pus is found the second or third washing is due to infection being carried into the sinus by the needle puncture and irrigation. This, of course, is silly, if the proper asepsis is taken. Why should the sinus mucosa become infected and the remaining nasal mucosa remain clean?

After the original needle puncture is made, it is a painless procedure, with the aid of a very little cocain, to reinsert the needle any number of times through this opening.

Now, as to the antrascope for diagnosing purulent sinusitis?

We do not use it. Personally, I have tried it a number of times, but the little window always gets fogged with some fluid and I cannot see pus through this fog. I have seen in several healthy sinuses with it.

Packing the antrum after a radical operation:

We do not believe this to be absolutely necessary, since we have been cutting away the flap of mucous membrane under the inferior turbinate, but we continue to pack both the sinus and the nose, on the side operated upon, to control any post-operative bleeding. We remove the nasal packing in 24 hours, the sinus packing in 48 hours. Our after-treatment consists of keeping the parts clean with saline irrigations and a bland oil spray to cover the mucous membrane.

XCIV.

CHRONIC HYPERPLASTIC SINUSITIS (ANTRAL): REPORT OF CASES.

By T. R. Gittins, M. D., F. A. C. S.,

Sioux City.

It is very probable that chronic sinusitis of the hyperplastic type exists much more commonly than is generally believed. The absence of the usual symptoms of sinus disease and negative irrigations are probably the important factors in confusing the diagnosis and treatment. Recurrence of nasal polyps, hyperesthetic rhinitis and various general disturbances can very frequently be traced to hyperplastic antrum infection. X-ray alone or with the aid of radiopaque substances often offers the only positive diagnostic procedure before exploration of the sinuses. As a rule, these hyperplastic antrum infections can be classed as masked, comparable to mastoiditis, as it appears especially in infants with gastrointestinal troubles. Three cases are reported in abstract here, not because they represent any rare condition, but because they tend to emphasize several different phases of this subject.

Case 1 presents an exaggerated instance of chronic hyperplastic antrum infection, wherein the polyp formation, besides filling the antrum, eroded through the nasal wall of the sinus. It extended on through to the nasopharynx, completely obstructing this space, and becoming strangulated gave the clinical symptoms of malignant tumor or gumma.

Case 2 is the record of a severe arthritis of rather long standing. Numerous attempts had been made to eliminate foci. Tonsils and dead teeth had been removed, and the nose and sinuses had been pronounced negative several times, mainly because there was no discharge in the nose or throat, no history of head colds, and a blurred right antrum had been negative on irrigation. A radical antrum operation disclosed the cavity completely filled with degenerated polypoid material. A very rapid cellulitis developed in the tissues of the right face and neck the next day, with a fever of 104. Many joints be-

came swollen and painful, and the clinical course was stormy for most of a week. No pus developed in the antrum cavity or around the sutures. After the acute reaction subsided there was a marked and rapid improvement in the arthritis and in the general physical condition. This improvement has been so permanent that now, a year after the operation, the patient is continuing her nurse's training, where before she was practically bedridden. Apparently the reaction following the operative procedure served the same purpose as that obtained from a foreign protein, but with a better result in this instance because the protein was specific.

In case 3, a masked hyperplastic bilateral antrum infection was found in a very severe case of bronchial asthma. Medical examination and pollen tests had revealed nothing, and at the time of the sinus examination the patient was taking hypodermic adrenalin six to twelve times every twenty-four hours. Here again the nasal history was negative. There was no discharge in the nose, and nothing was obtained on irrigating the antra, although they were blurred in the X-ray picture. Several irrigations on different days were negative. A radical antrum operation disclosed infected hyperplastic tissue in both antra, with marked involvement of the right one. Within two days after the operation adrenalin injections were not necessary and have not been used for the three months since the operation. Apparently the asthma has completely disappeared, but it may be that it is only a temporary improvement. At least, eliminating the masked hyperplastic antrum infection, completely altered the clinical picture for three months after all other measures except large doses of adrenalin had failed to give any relief in over a year of treatment. The object in reporting this case is not to claim a cure of asthma, but rather to stimulate a more diligent search for this type of sinus infection in such cases.

CASE REPORTS.

Case History 1.—A man of 36 years entered the hospital with a preliminary diagnosis of a malignant growth in the nasopharynx. There had been for many months an obstruction of the nasal breathing and interference with speech. Patient had complained of a very bad taste and odor and had expectorated necrotic masses from the throat. There had been

very slight drainage from the nose and no history of sinus symptoms, acute or chronic. There had been, however, considerable effect on the general condition with nervousness, poor appetite, sleeplessness and some loss of weight and strength. Patient gave a history of poor nasal breathing for years but never had been subject to frequent or protracted head colds. Postnasal discharge had been troublesome only recently and consisted mainly of small fragments of tissues with a bad taste and odor.

Examination: Tonsils small with some chronic infection. Practically no movement of the soft palate. Nasopharynx practically filled with a brownish sloughing mass. Pieces of necrotic tissue could be easily removed without bleeding. Very bad odor. Teeth in good repair. Septum deflected badly to the right with poor breathing space on the right. Polypoid membrane evident in right middle meatus, but nasal obstruction too complete for any view of the posterior portion of the nasal spaces. Transillumination: Right antrum dark, other sinuses quite clear.

X-ray: Marked blurring of the right antrum and some blurring of the right ethmoid. Other sinuses clear. Antrum puncture right. Small amount of thin, straw-colored fluid came through the trocar. Irrigation very difficult because of pressure. Small amount of thin mucus returned. Several pieces of necrotic tissue removed from the nasopharynx for laboratory examination. No bleeding.

Laboratory reports: Material removed from nasopharynx—1. Necrotic tissue with no cellular structure. 2. Blood Wassermann negative. 3. W. B. C. 12,600; reds 4,100,000.

Operation: Radical antrum right, local anesthesia. Antrum found practically filled with polypoid tissue and small amount of straw-colored fluid. No pus. Tissue in antrum grasped with forceps and the entire mass, including that in the nose and nasopharynx, came out intact. The posterior portion was necrotic from strangulation. After removal, the antrum cavity appeared smooth. No curettement was necessary. There apparently was some enlargement of the entire cavity, and the bone was thin, especially on the anterior surface. A large dehiscence was evident in the nasal wall of the antrum, through which the polypoid masses had eroded into the nose and on into

the nasopharynx. Antromeatal opening under the inferior turbinate. Incision closed.

Progress: Patient made a rapid, uneventful recovery. A small amount of thin discharge came from the antrum cavity for a few days. Nasopharynx appeared normal. Nasal breathing much improved and speech defect gone.

Laboratory report: Tissue removed from the antrum, nose and nasopharynx: Polypoid degeneration of mucosa. Chronic purulent process.

SUMMARY.

1. Patient entered the hospital with a preliminary diagnosis of a malignant growth in the nasopharynx. Local and general symptoms favored this diagnosis.

2. History quite negative with reference to the usual symptoms of acute or chronic sinus trouble.

3. Nasopharynx found filled with a brown necrotic mass, bad odor; portions of the mass removed without bleeding.

4. X-ray showed right antrum blurred. Antrum irrigation negative except small amount of thin, straw-colored fluid. No pus.

5. At operation right antrum found to be the seat of a chronic hyperplastic sinus infection with erosion of a large part of the nasal wall of the antrum and protrusion of a polypoid mass into the nasopharynx. Strangulation of this mass had produced the necrotic tissue, bad taste and odor which had prompted the patient and family doctor to consider malignancy.

6. Absence of purulent discharge before, during or after operation.

7. Rapid and complete recovery following radical antrum operation with removal of polypoid tissue.

Case History 2.—P. M., age 19, nurse.

March 23, 1928. History: Arthritis in various joints for several years. Referred now by orthopedist because of more active trouble in a number of joints which has not responded to treatment. No history of discharge from the nose or throat, very few colds and good breathing space. Tonsils and dead teeth have been removed.

Examination: Tonsils have been removed. Throat in good condition. No devitalized teeth. Septum quite straight (sub-

mucous operation had been done several months previous to this examination), but no pus in the nose. No sinus tenderness. Transillumination: Right antrum dark, other sinuses quite clear. X-ray of the sinuses showed a very marked uniform blurring of the right antrum; other sinuses quite clear. Marked mitral murmur, apparently of long standing. Antrum puncture and irrigation, right, no pus returned but irrigated freely.

March 29. Operation: Because the patient showed definite evidence of focal infection and because the right antrum showed a marked blur in the X-ray, a radical antrum operation was advised and performed on this date. The opening was made in the canine fossa. The antrum cavity was so completely filled with degenerated hyperplastic tissue that this material bulged through the opening. The material was removed easily with a curette, leaving a smooth white antrum cavity. There seemed to be no relation to any tooth socket, and none of the hyperplastic tissue was firmly attached in any one place. There was no free pus, but a portion of the tissue was badly softened and degenerated. The usual intranasal opening was made. The material was sent to the laboratory.

Laboratory report: The material removed from the right antrum was of dense hyaline material, with no tissue structure present. Bits of mucosa show a mucoid degeneration.

Progress: On March 30, there was considerable swelling of the right side of the face. Temperature during the day went up to 103. A marked cellulitis developed over the whole right side of the face very rapidly, some tenderness. Skin was reddened but did not show any red border of erysipelas. The patient ran rather a stormy course for five or six days, with an active cellulitis, considerable fever, and pains and aches over the entire body. No fluctuation at any time in the swelling of the face, and there was no pus around the sutures or in the nose.

April 5th. The swelling of the face was markedly reduced. There was still some temperature, but the general condition was much better, especially the joints. There was quite a rapid improvement in the athritis from this date, and on April 30th the patient was dismissed. The general health was very good. There had been a marked gain in weight. The swelling and

pain in the various joints had practically disappeared. The patient stated she was freer of joint troubles than she had been for years.

September 21st. Patient has been examined at intervals during this summer and early fall, and is working as a nurse. Her general health and weight have gradually improved since the antrum operation, and she has no pain in any of her joints. Some of the permanent changes in the joints are, of course, still present, giving some stiffness.

Comment: This case is reported because it represents the focal part played by a hyperplastic antrum infection which was almost masked. This patient had never had symptoms of sinus trouble. There was a good breathing space and no pus in the nose. Irrigation of the right antrum was negative, but she did have a positive X-ray finding. This positive X-ray was the only finding which led to an exploration of the antra. The marked reaction in the form of a cellulitis of the face and high fever indicated that the focus was a fairly active one. The rapid improvement in the joints and general condition, and the permanent improvement that she has shown since, indicated without much doubt that the quiet hyperplastic antrum infection was the real focus in this case.

Case History 3.—Mrs. H. M., age 48 years.

History: Patient referred by internist, with the diagnosis of bronchial asthma. Asthma began one year ago and has gradually increased in severity. For the last two months patient has been unable to work and has been bedridden part of the time. The only relief has been obtained by hypodermic adrenalin injections, and of late these have been given as much as four to eight times in twenty-four hours. Internist reports general examination negative except for the asthma, and patient is referred with the hope that some focal infection may be found in the head.

Examination: Patient is a rather fleshy individual, breathing quite labored and considerable asthmatic wheezing. Nose: Septum is deflected slightly to left; rather poor nasal breathing space. No pus in the nose or nasopharynx. Transillumination: Right antrum quite dark; left antrum and frontals fairly clear. Moderately enlarged chronic tonsils. One crowned tooth. Some pyorrhea around front teeth. Both antra irrigated; fluid

returned freely with no pressure and no pus. X-ray of sinuses: Right antrum quite dark, left antrum cloudy, other sinuses fairly clear. Right antrum was irrigated several times, never any pus and no difficulty in irrigation. We suggested to the patient and the internist that we felt that the right antrum and the tonsils could be acting as foci, and suggested that the antrum be explored first.

Operation: On July 14, 1928, a radical antrum operation, right, was done under local anesthesia. The lower half of the antrum was filled with polypoid degenerated tissue, with a small amount of thick exudate or pus adhering to the tissue. This material was quite easily removed from the antrum, leaving a clean cavity and no evidence of connection with a tooth socket. Because of the findings in the antrum, the left antrum was also explored, and the same thickened polypoid membrane was found, but of less degree. Patient remained in the hospital for seven days and the asthmatic condition improved very rapidly. After the first two days no adrenalin was needed to give relief. Laboratory report: Tissue removed from the antra, infected polyps and thickened degenerated mucosa. Culture report was not obtained because of an accident to the material in the laboratory.

Progress: The rapid improvement in the asthmatic condition was very gratifying, but we informed the patient that such was very often the case after any operative procedure and we still could not promise any permanent result. Patient reported at intervals for three months, and during this time had not had any asthma and had greatly improved in general health. No adrenalin had been used since patient had left the hospital.

Comment: Two months and a half of freedom from asthma attacks is, of course, not long enough to claim any cure. However, there was such a marked change in the patient who had suffered constantly for a year, that we could at least feel encouraged that the chronic antrum infection was playing a great part. This case is reported not entirely because of the effect on the asthma condition, but to emphasize again that a marked hyperplastic sinus infection probably exists much more frequently than we usually think. Except for the X-ray findings, there were no symptoms or physical signs to suggest the condition that we found.

SUMMARY.

These three cases are not reported because they represent any rare condition. On the contrary, they have been chosen as types to emphasize the importance of a careful search for so-called masked or hyperplastic antrum disease. The absence of the usual signs and symptoms of sinus infection is the most important feature in such cases, and tends to delay or confuse the diagnosis. X-ray, with the help of radiopaque substances, makes the diagnosis relatively easy, but unfortunately these agents are not used frequently enough, especially where focal infection is being considered. Absence of pus confuses many an investigator, especially where the antra are being considered. Undoubtedly, there are numerous instances wherein the positive X-ray findings do not represent infective processes, possibly because of thick bone or some other physical condition. It is not our thought that all blurred antra should be explored, but it is our opinion that such a procedure is justified in many cases similar to those reported here.

DAVIDSON BUILDING.

XCV.

SCALP TENDERNESS AS AN INDICATION OF DURAL INVOLVEMENT IN MASTOIDITIS.

By O. Jason Dixon, M. D.,

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While observing a series of cases of acute mastoiditis, scalp tenderness has frequently been the patient's chief complaint.

Failure to elicit cause for this complaint outside the affected ear, and prompt relief following mastoidectomy and exposure of the dura, has prompted me to investigate each case of mastoiditis, prior to operation, for scalp tenderness. When present I have been able to reproduce this symptom of dural irritation by packing snugly against the dura following operation. Aside from the clinical interest, the symptom has proven of value in several ways.

First, as an indication for exposure of the dura of the middle fossa at the operation.

Second, assistance in selecting the most extensively involved ear in bilateral mastoiditis.

Third, as an additional indication for mastoidectomy.

Fourth, the diagnosis and drainage of an extradural abscess and possibly the prevention of this complication.

In addition to the scalp tenderness, which is unilateral, there is usually a complaint of shooting pains in the eye on the corresponding side of the head, and sharp, intermittent shooting pains deep within the ear. The patient is always able to differentiate these pains from those associated with the otitis media. These patients usually are quite nervous, sleep poorly, lose weight, have a poor appetite and run a normal temperature. The hemoglobin drops 20 to 30 per cent, and they have a leukocytosis of 10,000 to 13,000. There may or may not be an increase in localized mastoid tenderness.

The ear findings in most cases are no different from those of an ordinary acute suppurative otitis media. The history nearly always elicits a stormy siege of otitis with delayed mid-

dle ear drainage by spontaneous drum rupture which gives little relief.

When these patients come to operation my attention is directed to the marked zygomatic destruction and extensive involvement upward and forward from the antrum extending into and involving the dura of the middle fossa.

Dural involvement is more frequently met with in adults, particularly those of 50 years of age or over, with a thick, tough drum, a hard, dense cortex and an adherent periosteum, through which it is difficult to establish spontaneous drainage. Patients with dural involvement are also more difficult to anesthetize. The following are a few of the most typical cases:

A rugged Irish laborer, age 52 years, was referred to my service at St. Margaret's Hospital, on account of a discharging ear. His ear pain had been severe for four days, when it was relieved by a spontaneous drum rupture and free drainage. For ten days his chief complaint was scalp tenderness on the corresponding side of his infected ear. The pressure of his hat hurt him, and to brush or comb his hair was unbearable. He was unable to lie on that side of his head at night. I could make out no cellulitis or inflammation of the scalp, and, as there was on postauricular edema or tenderness, it was hard to place the entire blame on the ear. He ran no fever and had a normal pulse rate. However, the head pain, ear discharge and scalp tenderness persisted and he was losing ground rapidly, so I decided to open his mastoid. The mastoid was covered with an extremely hard, dense cortex, and practically all the involvement was high up near the middle fossa, extending into the zygomatic process. A small exposure of acutely inflamed dura was made. The next day he was free from pain, and on his own account got out of bed. Two days later the scalp tenderness and head pain returned, which was partially relieved by changing the packing. The next dressing gave him more relief, and, except for a slight remission ten days later, he has been entirely well and free from scalp tenderness.

A few weeks later I had occasion to operate upon a similar case. A man, 59 years of age, whose ear had been neglected for two weeks, with spontaneous drum rupture, preceded by severe pain lasting twelve days. He had deep seated, boring

pain. Aside from a moderate amount of scalp tenderness and a unilateral headache, with pain over the corresponding eye, the persistent discharge from the ear was the only direct evidence of mastoid involvement. At operation I found a large dural involvement necessitating an exposure of red, granular, bleeding dura, the size of a five cent piece. On the second postoperative day the preoperative symptoms returned, namely, deep-seated pain in his ear, pain over his right eye and marked scalp tenderness. These symptoms were immediately relieved by changing the dressing, which had become saturated with blood and serum, and which irritated the dura. The next day the same symptoms returned, which were relieved by a change of dressing. Had the patient been other than a large, rugged laborer, who had entered the hospital on the charity ward, I should have thought he was overly concerned about his wound and was desirous of a clean dressing. Never have I seen a patient who enjoyed a mastoid dressing during the first ten postoperative days. They are quite willing to postpone any dressing and readily forget when these are due. The dura in this case was granulating nicely and the aural canal was dry, so I decided to try out the influence of packing against the dura in relation to scalp tenderness. As a packing I used plain strip gauze, one-half inch wide, with a finished edge. When this was placed snugly against the exposed dura and the rest of the wound packed firmly (no closure sutures having been used), the scalp tenderness and head pain would come on in direct relation to the density of the pack, usually within eight to ten hours. This I tried three separate times with the same results, and then I decided to use no pack at all. This brought on the scalp and head symptoms earlier than the use of a gauze wick, which almost, but not quite, touched the dura, with the lower end protruding from the inferior angle of the wound. (See Fig. No. 1.) This afforded enough drainage to prevent pressure and accompanied toxic symptoms from the contained secretions. This patient made a complete, rapid and uneventful recovery, with no return of scalp symptoms.

In one youngster of 14 years of age, whom I had in the hospital three separate times with the expectation of operating, I was more or less disappointed in not having been able to observe this symptom, as I found at operation a very extensive

dural involvement in the middle fossa. The child was very nervous and irritable, and later her mother told me that, in order to avoid operation, they had intentionally withheld several of the facts. After the child was getting along all right, the mother was so pleased that she voluntarily made a trip to my office to confess to me some of her youngster's preoperative symptoms. One of the questions she asked me, which is quite common, particularly with girls, was if she could wash her daughter's hair. I advised her that there was no hurry about this, and I thought she had better wait a few days in order to avoid any contamination of her ear wound. Much to my surprise, the mother said the reason for the anxiety was that she had been unable to wash her daughter's hair for two months, on account of scalp tenderness, and that was one reason for having it bobbed. She had been unable to brush or comb it on the corresponding side of the infected ear. Since operation, and to date, this symptom has been absent and the youngster is entirely well.

One of the most interesting cases of scalp tenderness that has yet come to my attention was a laborer, age 54. He had had a four weeks' siege of earache, without drainage, and complained of extreme unilateral scalp tenderness. This pain radiated over a U-shaped area directly above the zygoma. He had a red, bulging, thick drum which, when incised, was followed by a profuse, thick, purulent discharge, with immediate relief from the earache. I kept him under observation in the hospital for a week, during which time he complained of sharp pains radiating from his ear upward. The ear continued to discharge, he slept poorly, lost weight, and the scalp tenderness not only persisted but grew worse; so much so that he was unable to lie on the affected side. Two days prior to operation he complained of dizziness, but had no spontaneous nystagmus. His leucocyte count was 9,800, he had a pulse rate of 74 and a temperature which remained at 98.6. The patient looked very sick and was rapidly losing ground. The night preceding the operation he was given morphin for pain and slept only from 10 p. m. until 2 a. m. The morning of the operation he fainted, but had no convulsive seizures. At operation there was slight postauricular edema, the periosteum elevated freely and easily and revealed bluish, freely bleeding bone, and on the first bite

of the gouge thick, yellow pus oozed through a small perforation far back over the posterior superior border of the mastoid, just above the emissary vein. This pus was later found to be coming from an extradural abscess, which was completely encapsulated by a pyogenic membrane which peeled off and was so tough that scissors were used in clipping. The undermining of the infection necessitated an exposure of dura extending from the middle fossa posterior and downward and forward, continuous with the course of the lateral and sigmoid sinus, nearly to the tip. (See Fig. No. 2.) There was a marked perisinusitis, with free bleeding from the perisinus vessels when the inner table was elevated. The zygoma was freely dissected out and the antrum was covered with a very thick, hard bone which bled freely and worked with difficulty, indicative of an old previous infectious process. Certainly this could account for the symptom of dural irritation, and this case demonstrated the amount of destruction that can take place without any objective symptoms. The patient made a prompt and uneventful recovery, with complete absence of scalp tenderness and pain.

Another neglected ear with scalp tenderness, in a man, age 28 years, with six-day severe pain followed by a spontaneous drum rupture with slight relief, came to me after an attack of influenza. The patient suffered intensely with pain on the top of his head and about the affected ear. He was unable to comb or brush his hair. There was no cellulitis or redness and no evidence of inflammatory extension. He had severe pain in and over the left eye and down over the left cheek, with soreness in the upper teeth. The ear drum was covered with blebs and was bulging. When incised there was a free discharge of watery, blood-stained fluid. This was followed by a more comfortable night, with continuous free ear drainage. The scalp tenderness diminished. The patient stated that the roots of his hair felt sore all over the left side of his head. It was necessary to move the bed from the window on account of extreme photophobia. There was no spontaneous nystagmus. The ear was entirely deaf. There was no postauricular swelling and no evidence of erysipelas. The superior canal wall was sagging. The blood count during this time ranged from 16,000 to 18,000. Wassermann was negative. Cell count was 5. Spinal fluid negative. His globulin and chloride were negative. The patient

required morphin for pain and his scalp tenderness continued. The temperature ranged from normal to 101° F. for four days, then returned to normal and stayed there with a pulse rate of 74. Four days after admission to the hospital I opened his mastoid. Large compartment cells filled with pus were exposed, after working through an extremely hard outer table. The bone bled continuously. The dura, when exposed, bled freely, but was not at any point adherent to the overlying table. It was covered with a dense pyogenic membrane with fibrous bands running anterior and posterior. (See Fig. No. 3.) This was exposed until normal blue dura was uncovered. The zygoma was not badly infected. The tip, while being cleaned out, broke off and was removed entirely in one piece. There was no sinus exposure. Aside from the wound, which was badly infected and suppurated profusely, the convalescence was uneventful. The scalp tenderness and head pain immediately disappeared.

A mother brought her eight-year-old daughter to me with the complaint of discharging ear, pain over and in her right eye and soreness in the right side of her head. The mother stated the daughter complained so bitterly about having her hair brushed that for several mornings she had examined the youngster's scalp closely for bumps or sores. For the last week she had pain just back of her ear. She had complained to her teacher of headache, particularly after study, and was not doing well in school. There was a moderate amount of thin, purulent discharge from the right ear and marked tenderness over the mastoid process and the right half of her scalp. Her temperature was 100° F. White blood count, 10,000. These symptoms continued for two days and the right mastoid was opened. Practically all of her infection was limited to the bone directly beneath the middle fossa, extending forward into the zygoma. An area of dura, the size of a dime, was uncovered, which was quite red and inflamed and bled freely. (See Fig. No. 4.) The tegmen was completely removed down to and into the antrum. Aside from this localized area of infection the rest of the mastoid cells were clean. A small area of normal sinus was exposed, while cleaning out these cells. Except for a slight recurrence of scalp tenderness, due to an irritation of the dura by packing, this child made an uneventful recovery

and left the hospital two days after operation. Her ear is now well and free from discharge and all symptoms.

I have two cases of scalp tenderness to report which were not due to dural irritation.

One, a man, aged 71 years, was referred to me on account of scalp tenderness, with pain in his right ear. This had lasted for a period of four days and was quite severe. Examination of his ear was entirely negative, with a swelling just to the right side of his nose, extending down to the gum. On pressure, this exuded pus about the root of the right upper bicuspid and was quite painful. (See Fig. No. 5.) I referred him to the dentist, who extracted these roots. The scalp tenderness almost immediately disappeared. The most surprising thing was that there was no disturbance of his ear. He had a negative Wassermann for blood and spinal fluid, white blood count 7,000, and normal temperature. His pain was apparently due to irritation of the mandibular branch of the fifth nerve, which was referred back through the gasserian ganglion to the ophthalmic branch, giving him scalp tenderness and pain in his ear, with no ear involvement.

The other patient with scalp tenderness, but without dural irritation, was a man, aged 63 years, who had a very stormy onset of acute otitis media with dizziness, vertigo, nausea and disturbance of gait. He had frequent sharp, shooting pains over the corresponding side of the scalp. This had gone on for seven days prior to my first examination, when I found a bulging, pulsating drum which was very thick, and on incision there was a profuse, blood-stained, straw-colored discharge. Much to my surprise, all of these unfavorable symptoms immediately cleared up and within two weeks this ear was dry, the drum healed, his hearing returned to normal and his scalp tenderness continued to be absent. This scalp tenderness was apparently not due to dural involvement.

Now why should a patient with involvement of the dura of the middle fossa, complicating a mastoiditis, have a tender scalp? A review of the anatomy of the fifth nerve will help explain. The following is from Cunningham's "Text Book of Anatomy."

"The fifth, or trigeminal nerve, arises from the inferior surface of the pons in its lateral part by two roots, a large sen-

sory root and a small motor root. The two roots proceed forward in the posterior fossa of the skull, and piercing the dura mater beneath the attachment of the tentorium cerebelli to the superior angle of the petrous part of the temporal bone, enter a cavity in the dura mater (cavum Meckelii) over the apex of the petrous bone. The large sensory root gradually conceals the small motor into a large flattened ganglion—the semilunar or gasserian ganglion. This ganglion occupies an impression on the apex of the petrous portion of the temporal bone, and from it three large trunks arise—the ophthalmic, or first; the maxillary, or second; and the mandibular, or third division of the nerve. The small motor root of the nerve passes forward beneath the ganglion and is incorporated wholly with the mandibular division of the nerve.

"The mandibular nerve is formed by the union of two roots: a large sensory root, from the semilunar ganglion, and the small motor root of the trigeminal nerve, which is wholly incorporated with this trunk. The two roots pass together beneath the dura mater of the middle fossa of the base of the skull to the foramen ovale, through which they emerge into the infratemporal fossa. Outside the skull they combine to form a single trunk, which same separates into anterior and posterior divisions.

"At its emergence from the skull the nerve is deeply placed beneath the middle of the zygomatic arch, and is concealed by the ramus of the mandible and by the masseter, temporal and external pterygoid muscles. The branches of the nerve may be divided into two series: First, those derived from the undivided nerve, and second, those derived from its terminal divisions.

"The branches of the undivided nerve are two in number: (a) a small nervus spinosus (O. T. recurrent nerve) arises just outside the skull, and accompanying the middle meningeal artery through the foramen spinosum, supplies the dura mater; (b) in the infratemporal region a small branch arises for the supply of the internal pterygoid muscle. This nerve forms a connection with the otic ganglion.

"The terminal divisions of the nerve are a small anterior and a large posterior trunk."

From this anatomic description it is quite evident that the fifth nerve is intimately connected with the dura of the middle fossa. Also it is a well known fact that nerves passing through the gasserian ganglion are quite susceptible to disturbances of sensation.

Behan and Head both mention localized scalp tenderness as an indication of increased pressure in the middle ear, but neither of them mentioned the relation of dural involvement. That the middle ear was not responsible for this symptom was demonstrated in the patient who had a dry middle ear and irritation of the dura was produced by packing.

La Fora, in 1915, brought out a symptom somewhat similar to scalp tenderness—that is, nasal itching, which he says is dependent upon the irritation of the trigeminal branches or of its ganglion. He discusses the sensory intervention of the nasal mucous membrane from the four trigeminal branches: (a) An internal nasal nerve, branch of the ophthalmic; (b) sphenopalatine nerves, branches from Meckel's ganglion; (c) posterior nasal nerve, a branch from the posterior palatine; (d) the pterygopalatine, a posterior branch from Meckel's ganglion.

He further states that basilar meningitis often causes an inflammatory incasement and toxic irritation of the gasserian ganglion, and this can extend along the nerves mentioned. It is an irritation phenomenon akin to the development of convulsions in helminthiasis.

The patient reacts to the itching sensation by persistent scratching of his nose, and this behavior in meningitis cases may continue into the period of semi-stupor. It is not an exclusive symptom of cerebrospinal meningitis, but is seen in all types, including tuberculosis and postotitic meningitis.

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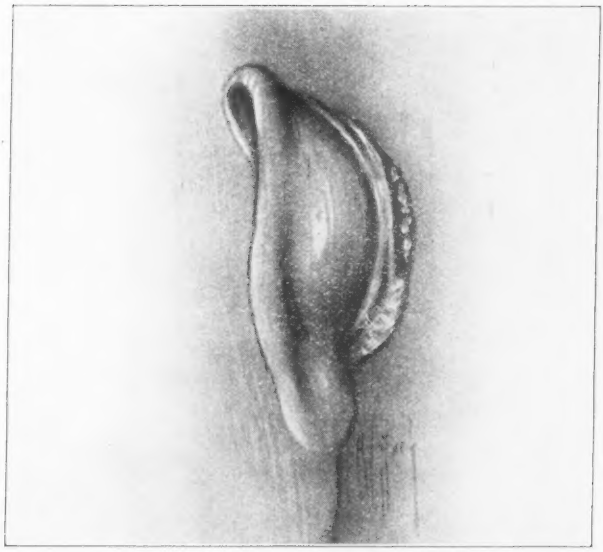

Fig. 1. Gauze wick used to afford drainage and prevent pressure and accompanied toxic symptoms from contained secretions. No sutures.

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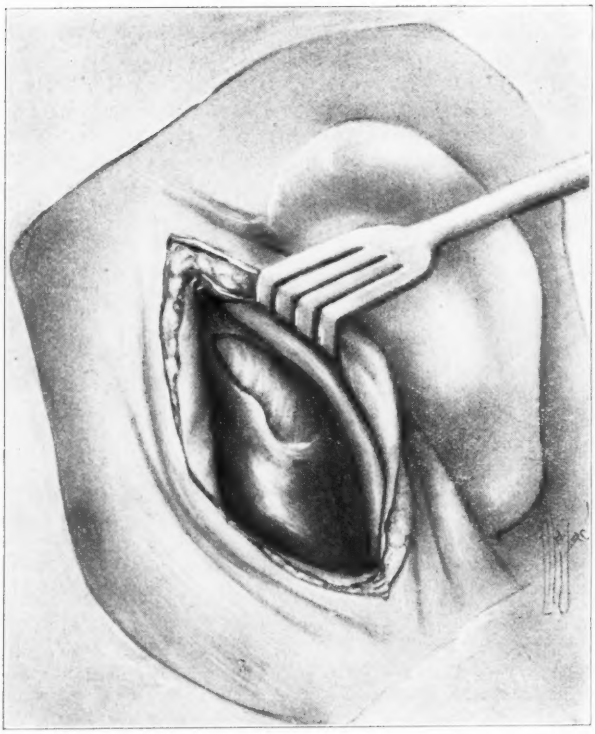

Fig. 2. Exposure of dura extending from the middle fossa posterior and downward and forward continuous with the course of the lateral and sigmoid sinus.

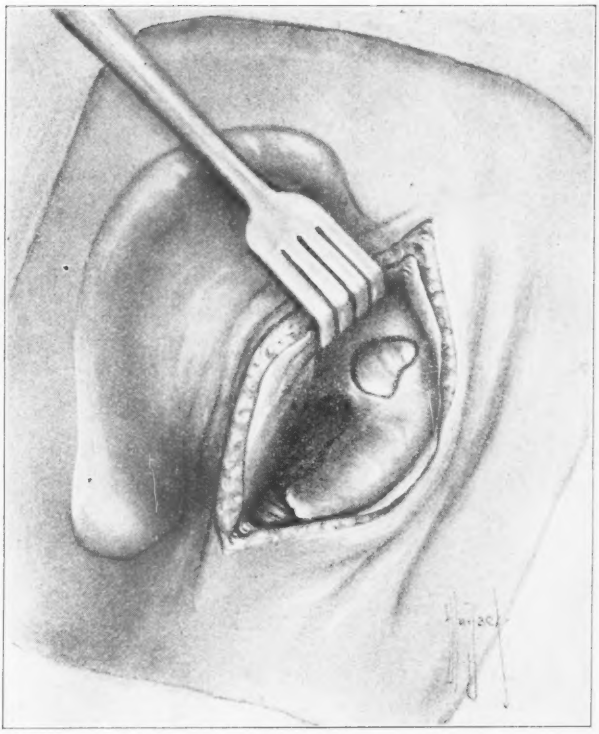

Fig. 3. Dura covered with a dense pyogenic membrane with fibrous bands running anterior and posterior. Tip removed.

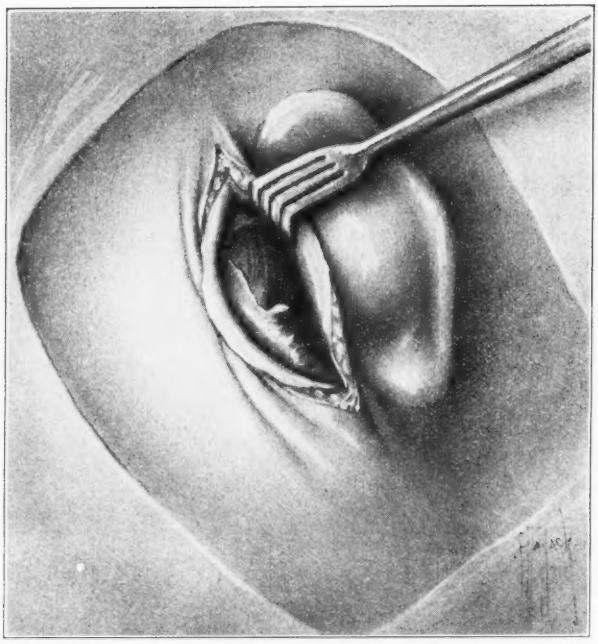

Fig. 4. Appearance of dura at time of operation. Note the extension down to the antrum and the fibrous bands covering the dura.

XCVI.

A STUDY OF THE FOSSA SUBARCUATA AS A PASSAGEWAY FOR INFECTION FROM THE LABYRINTH TO THE CEREBELLUM.

By David L. Poe, M. D.,

New York City.

While otogenic literature is replete with reports of infections passing by way of many avenues from the ear to the brain, it is singularly sparse in citations of infection going by way of the fossa subarcuata.

The above statement is made with a full consciousness of the valuable studies made by Waldhauser, Voltolini, Kuemmel, Troeltsch, Hartmann, Fremel, and others in this sphere.

Dr. Fremel has again opened up a discussion of this interesting topic by his recent contributions on the etiology of some types of cerebellar abscesses.

It is with a view of adding to the store of reported cases of infections passing from the ear to the brain by way of the fossa subarcuata that this paper is written.

This particular instance is that of a male, white, 38 years of age; United States citizen; married and the father of five children.

As a result of an attack of vomiting and dizziness, he consulted his family physician. After a period of treatment the patient showed evidences of improvement. Very shortly thereafter, however, he complained of an earache, for which he was referred to an otologist. After a careful examination, a specialist did a myringotomy. A serosanguinous fluid was obtained, from which a staphylococcus was isolated. The patient at this time complained more freely of headaches radiating from the ear. A mastoidectomy was performed. The sigmoid sinus was exposed. The mastoid part of the temporal bone was found hard and eburnized. No other pathology being found, it was deemed advisable to await further developments. The patient continued to complain bitterly of headaches, even after the

operation. In the course of several days' medical consultation was sought and further exploration was decided upon, but before anything further could be done, the patient passed out. Permission for a postmortem examination was obtained.

After the calvarium was removed, the convexity of the brain and the meninges was found to be slightly infiltrated, the luster was gone, and only a very slight exudation was observed. On the base of the brain there was, however, pathology of considerable dimensions. In the left posterior fossa there was about 40 or 50 cc. of purulent matter containing granular flocculent masses, which was cautiously wiped out and a careful inspection made of the interior of the skull and its contents. The relationship of parts was also closely scrutinized. When the brain was slightly raised from its bed, a direct avenue of communication was seen leading from the cerebellum through the fossa subarcuata to the internal ear. Pus was clearly seen to pour through the fossa into the interior of the cranium. Further examination did not disclose any other pathologic communication between the internal ear and the brain. The opening in the bone, constituting the fossa subarcuata, was quite large, the edges were rough and denuded of substance. The orifice of the internal accoustic meatus was smooth and apparently intact. The tegmen antri and tegmen tympani appeared normal. There was no sequestrum, no fistula, no sinus observable anywhere in the petrous part of the temporal bone. It could be safely said that the fossa subarcuata was the passageway through which the infection found its way from the ear into the cranium.

The petrous portion of the temporal bone was cautiously chiseled out, decalcified with Politzer's decalcifying fluid, embedded in celloidin, serial sections made and a microscopic study undertaken.

Before embarking on a discussion of the microscopic study, it might not be out of place to state a few words anent the embryology and development of the fossa subarcuata. It might greatly contribute to our better grasp of subsequent pathology.

Dr. Eckert Mobius, in his description of the embryology of this organ, has the following to say:

"In the early stages of development the floccular fossa is a structure that represents more than a mere depression in the

petrous part of the temporal bone, lodging a process of dura mater. This body is part of an elaborate intercommunicating cartilaginous canal system through which large numbers of blood vessels ramify. Along the ramification of these vessels the fossa communicates directly with the labyrinth, also with the facial canal. Only after ossification occurs and pneumatization sets in do we find many of these communicating canaliculi obliterated. In a disturbance of pneumatization part of these intercommunicating canaliculi may persist long after the period when they normally should be closed."

In an examination of a fairly large number of infant temporal bones at the otologic department of the Post-Graduate Medical School and Hospital and the School of Otology and Ophthalmology of the New York Eye and Ear Infirmary, New York City, the writer uniformly found a large opening present (the fossa subarcuata), the remains of the floccular fossa, a conspicuous depression in the fetal bone. In many adult bones this opening is almost obliterated; in others, there remains a small depression, usually lodging a process of dura mater, and transmits a small vein; while still in others a persistent large opening may be found. In a series of adult specimens with persistent embryonic fossæ, examined at the above institutions, the writer found deep depressions which were either oval, round or irregular in contour, and in the floor of which were several foramina through which a bristle could easily be passed into the labyrinth. Such an aperture in a temporal bone always remains a menace to the life of its possessor. There always stalks the danger of an infection easily passing from the internal ear to the brain.

In the case now being reported, it was observed at the time of the postmortem, when the brain was only slightly raised from its seat at the base of the skull, that a veritable stream of pus gushed through the fossa subarcuata into the interior of the cranium. No pus was seen to pass through the internal accoustic meatus or through any other opening. A macroscopic examination of the petrous portion of the temporal bone disclosed a smooth, intact orifice about the internal accoustic meatus, while the orifice about the fossa subarcuata was rough, irregular and denuded of substance. From a macroscopic study, we would not hesitate to say that the infection passed

solely by way of the fossa. A microscopic study of the same organ disclosed the fact that while the fossa subarcuata was a passageway through which the pus from the ear streamed into the cranial vault, other communicating channels undoubtedly also played an important rôle through which the infection passed.

The petrous part of the temporal bone, after being decalcified, was cut in serial sections and microscopically examined. It was found that the labyrinth was filled with pus, and in which the polynuclear leucocyte predominated. The vestibular membrane (Reissneri), which normally extends from the thickened periosteum covering the osseous spiral lamina to the outer wall of the cochlea, where it is attached at some little distance above the outer edge of the basilar membrane, was practically totally destroyed in all of our sections. The spiral ligament, which normally is really the thickened periosteum that has undergone some modification, and forming the outer wall of the ductus cochlearis, remains attached to the bone, showing its normal anatomic contour, but showed considerable serous infiltration and new connective tissue organization. The basilar membrane, which normally stretches from the free edge of the osseous spiral lamina to the outer wall of the cochlea, while in many of our sections indicated much change in character, was still preserved in form so that it continued to serve part of its function in that it completed the roof in the scala tympani. The spiral organ of Corti, which is situated on the membrana basilaris, was totally destroyed. On the site of the organ of Corti was a clump of pus. There was hardly a vestige of the normal organ to be found. The upper portion of the spiral ligament, termed stria vascularis, because in the healthy state it contained numerous capillary loops and small blood vessels, was partially destroyed, in parts infiltrated and organized. The scala vestibuli and scala tympani, as well as the remains of the scala media, were all pretty well filled with purulent masses. The osseous lamina shows evidences of much destruction, infiltration, hemorrhages and dilated capillaries. The ganglion spirale were also practically completely disrupted.

Very interesting, indeed, is the trunk of the accoustic nerve as it is followed into the internal accoustic meatus. Its fibers are distended, separated, and a great many of them are de-

stroyed. On large magnification one can easily see large bodies of purulent substance on and between its fibers. Many of them have been severed in their continuity, and many have entirely disappeared. Débris of their former existence can occasionally be made out lying to one side or intermingled with the cellular elements which go to make up the purulent masses.

It was already stated in this paper that our macroscopic observation would lead us to conclude that the infection passed by way of the fossa subarcuata solely into the cranial cavity, but a microscopic study disclosed other portals of entry. This study convinces us that macroscopic observations only are insufficient for pathologic diagnosis.

While this paper is primarily intended as a study of infection passing from the ear to the brain by way of the fossa subarcuata, it might be not altogether uninteresting to make a few comments concerning the large cerebellar abscess which was found.

Dr. Fremel of the Neumann Clinic, Vienna, reported a very careful study of the development of six cases of cerebellar abscess arising from otogenic causes. He showed quite successfully that an infection passes through the cerebellar cortex at that place where it is in contact with that part of the temporal bone where necrosis exists and, instead of penetrating and destroying the cerebellum in all directions, the organisms, as soon as they gain entrance, spread out, fan-shaped, destroying the medullary substance in more or less flat manner, without attacking the cortex. The writer has a section of cerebellum in his possession, obtained from Dr. Fremel, the gray matter of which shows no evidence of injury or of having been a portal of entrance for pyogenic organisms. It was only after serial sections of the cerebellum had been made that a small cerebellar abscess was found in its interior. In our case the abscess was so large that it could be seen as soon as the cerebellum was examined. It extended from the lateral border of the lateral lobe to almost the vermis. The inferior and superior surfaces of the cerebellum were singularly intact. The lateral border of the posterior inferior semilunar lobe had the appearance as though it were cut with a knife, except at the central region, where it was somewhat irregular. It was semilunar in form. When the lips of the cleft were drawn apart it was

seen that in the center of the cerebellar lobe was a pyogenic membrane extending from the lateral border to almost the worm, that the white matter was destroyed in a flat fan-shaped manner. The lips of the cleft could be so brought together that hardly any loss of substance could be discerned. Unfortunately no serial sections of the brain were made. The brain was needed for a pathologic museum. The meningeal plates, normally extending from the fossa subarcuata to the brain, were to a great extent destroyed. There were multiple intradural abscesses, such as Fremel described. That, of course, is not an unusual finding, but rather something to be expected in our case.

Summary.—The fossa subarcuata in most all adult temporal bones is obliterated; it may exist as a small depression lodging a process of dura mater. In some instances it may persist in its embryonic state, and when it does, as in our case, it is an easy portal of entry of infectious organisms from the ear to the brain. The patient had suffered from a diffuse labyrinthitis. While the infection to the brain passed through several openings in the petrous part of the temporal bone, the fossa subarcuata played the earliest and most important rôle as a passageway to the brain.

I wish to extend my sincere appreciation to the Eno Laboratory of the New York Eye and Ear Infirmary for the assistance unselfishly rendered in preparing the microscopic sections.

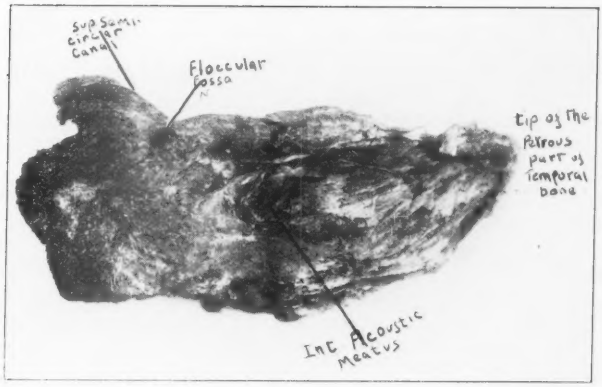

Fig. 1. The petrous part of the temporal bone, showing the fossa subarcuata with denuded edges, superior semi-circular canal and the internal acoustic meatus. The meatus is normal in appearance.

Fig. 2. One turn of the cochlea showing the basilar membrane, and the spiral ligament. The scala vestibuli and scala tympani and scala media are filled with purulent masses. A large clump rests upon that part of the basilar membrane normally occupied by the organ of Corti. The osseous lamina shows hemorrhages and dilated capillaries. There is complete destruction of the ganglion spirale.

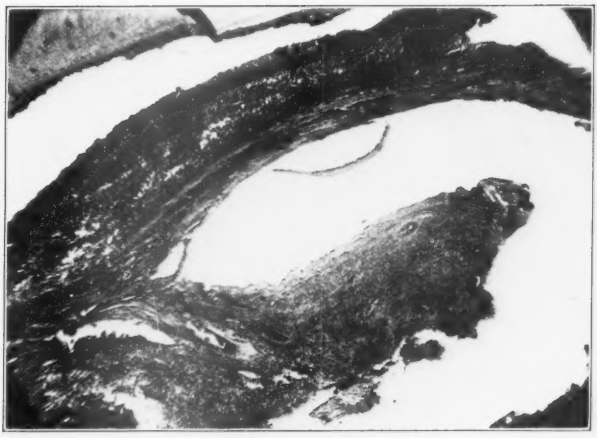

Fig. 3. High magnification of the acoustic nerve within the internal acoustic meatus, showing the nerve to be entirely disrupted by purulent masses.

XCVII.

TUBERCULOSIS OF THE NASAL ACCESSORY SINUSES.*

By Francis L. Lederer, S. B., M. D., and

George S. Livingston, M. S., M. D.,

Chicago.

Tuberculosis of the nasal accessory sinuses, because of its relative infrequency, has prompted the writers to review the literature and report the clinical study of a quite typical case. In a review of the case reports of other observers, one is impressed by the difficulty of determining, in spite of careful study, whether the process in the sinuses was primary or secondary. Most of the cases were well advanced when first seen, many of them with complicating or coincident tuberculosis in other parts of the body, so that even careful necropsy study failed to establish positively a primary lesion in the sinuses, except in very few cases. Hajek[1] states that tuberculosis of the ethmoid labyrinth is extremely rare, and occurs apparently as a primary disease less frequently than as a process secondary to tuberculosis of the septum. He has seen two cases of primary tuberculosis of the ethmoid which he has not published. Finder[2] collected three primary cases from the literature, to which he added a fourth, and Lund[3] reported another case. van Hoogenhuyze and deKleyn[4] report two cases of a unilateral ethmoid lesion which extended to the maxillary sinus, causing nasal obstruction and purulent discharge from the naris of the same side, and without eye symptoms. Operation revealed caseous masses of typical tuberculous granulation tissue, containing giant cells and tubercle bacilli. Both cases were cured. Kurzak[5] describes in great detail the case of a man of twenty years who complained first of pain over the eyes and in the left upper and lower jaws, followed several months later by diplopia and diminished vision, first in the left, then in the

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right eye. The visual fields narrowed coincident with proptosis, which was more marked on the left side. Pus was seen in both sides of the nose and in the nasopharynx. The sphenoids were opened and pus was found in both cells. Lumbar puncture yielded a clear yellow fluid, containing globulin but no bacilli. At necropsy a tumor mass was found at the base of the skull near the optic chiasm. The sphenoids were filled with similar material, which proved microscopically to be tuberculous tissue. Stockert[6] and Tiefensee[7] each report a case of tuberculosis involving the body of the sphenoid, with extensive destruction of adjacent structures, including the hypophysis and optic nerve, and a basilar meningitis. The latter's case was one of generalized tuberculosis.

Panse's[8] patient, a sixteen-year-old girl, suffered from chronic nasal obstruction. Polyps had been removed from the nose many times. Finally severe headache and blindness supervened. Operation on the frontal sinuses and ethmoids disclosed caseous masses which were proved microscopically to be tuberculous. Autopsy showed sphenoid involvement also, and a localized basilar meningitis. There were also old foci in the lungs and the bronchial and cervical lymph nodes. Levy[9] reported the case of a child of two years, who presented an abscess below the left eye and a fistula above the right eye. Death followed hemorrhage through the mouth and nose. At necropsy the body of the sphenoid was found destroyed, as well as caseous masses in the frontal, ethmoid and maxillary sinuses. Heidkamp's[10] case was one of generalized tuberculosis, with caries of the base of the skull. The ethmoids and sphenoids were filled with caseous masses. Dörner[11] described the case of a thirty-one-year-old woman, in which tuberculosis of the left ethmoid and antrum was found, with a fistula externally through the tear sac. Operation effected a cure. Microscopic section confirmed the clinical diagnosis. Ebstein[12] reported a case of generalized tuberculosis, with pus in the ethmoids and sphenoids and sequestrum formation. Death occurred from meningitis. Lockard,[13] in a case of pulmonary tuberculosis, found tuberculous involvement of the maxillary, ethmoid and sphenoid sinuses of the right side, which apparently had extended from a focus in the maxilla. Frank and Kunze[14] had a case of tuberculosis of the frontal sinuses which perforated

the posterior wall and involved the dura. Pulmonary tuberculosis was also found. In Vohsen's case[15] a fistula in the forehead led to bone necrosis and caseous masses in the frontal sinuses. Schenke,[16] in a case of tuberculosis of the ear, found a swelling of the forehead and caseous masses in the frontal sinuses. Scheibe[17] reported tuberculosis of the ethmoids with a fistula externally and no other tuberculous lesions. Freer's case[18] was one of tuberculosis of the right ethmoid labyrinth. Finder,[19] in a case of pulmonary tuberculosis of many years' standing, found tuberculous ethmoiditis with a fistula communicating externally. Eighteen other authors reported cases of tuberculosis of the maxillary sinus alone; some primary, others secondary to pulmonary foci, and some in which the status was not stated.

REPORT OF A CASE.

The patient, G. L., was a colored boy of seventeen years, born in Mississippi, employed in a factory. His first admission to the hospital was on December 7, 1926, to the ophthalmologic service, because of loss of vision and swelling of the eyelids.

The history revealed that for years the patient had suffered from frontal headaches, which in the previous few months were becoming increasingly frequent and severe. The pain, occurring daily, was most severe in the morning, abating in the evening. At times attacks of vertigo occurred, which necessitated lying down. Nausea after meals, without vomiting, was a constant accompaniment of the vertigo. Anosmia was noted about ten months prior to admission and has persisted. About July 1, 1926, bleeding from the nose began and recurred at frequent intervals, from both nares, for a month. At this time he first noticed swelling of the upper eyelids, which increased gradually and progressively. He was then seen in the outpatient department, where he was found to have normal vision of both eyes. A tentative diagnosis of blepharochalasis was made at the time. In November he noted failing vision of the right eye, which became blind in four days, followed by blindness of the left eye four days later. During this period he experienced some orbital pain. The appetite was good and there had been no loss of weight. His past history showed

gonorrhea about a year before. He denied syphilis. He was an only child. Both parents were alive and well.

Physical examination revealed a well developed, well nourished colored male, not acutely ill, but totally blind. He was mentally alert and answered questions intelligently. There was a great broadening of the root of the nose and a considerable proptosis of both eyes of about equal amount. (Fig. 1.) The ocular movements were moderately restricted. The pupils were equal in size, regular and reacted normally to light, directly and consensually. The media were clear. The ophthalmoscope showed a moderate optic neuritis in both fundi.

Rhinoscopic examination showed a moderate deviation of the septum to the right. The inferior turbinates were large. The middle turbinates were very much enlarged, impinging on the septum. Their mucosa was pale. In the middle meatus on each side a small amount of granulation tissue was seen and a whitish mucoid secretion. When touched the tissue bled easily.

Roentgen examination revealed a diffusely increased density over the upper parts of the maxillary sinuses, both ethmoid regions, the nasal cavities and the frontal sinuses. The medial orbital walls, the left orbital roof and parts of the sphenoid walls showed irregular mottling. The sphenoid sinus was clouded.

General physical examination was negative. The heart was normal. The lungs were clear, as was the X-ray examination of the chest.

Blood examination showed 4,250,000 erythrocytes, 8,800 leucocytes and hemoglobin 70 per cent. The Wassermann reaction of blood and spinal fluid was negative. The Von Pirquet test was slightly positive after twenty-four hours. Complement fixation test for tuberculosis was negative.

On December 16th, both ethmoids and sphenoids were exenterated under local anesthesia. Large amounts of granulation tissue were removed, and the cells were found filled with caseous masses. The material removed was examined microscopically and found to be tuberculous granulation tissue, with typical tubercles containing giant cells. (Fig. 2.)

The immediate postoperative course was uneventful. Vision did not return in the slightest amount. About ten days later several soft tender circumscribed swellings appeared over the glabella and left supraorbital ridge. During this period a course of antiluetic treatment was given as a therapeutic test. No effect was noted and the swellings increased in size, becoming fluctuant.

On January 6, 1927, under ether anesthesia, incision was made through both eyebrows and across the glabella. A large flap was raised, exposing the frontal bone. (Fig. 3.) Here, at the site of the swellings, pus was found, exuding from several fistulæ from the frontal sinuses. The sinuses were widely exposed by removing the external walls, and were found filled with yellow caseous masses. The lining membrane of the sinuses was tremendously thickened; its surface was irregularly studded with pale granulations. The posterior wall was markedly carious. Large sequestra were easily removed, exposing the dura, which was also very thick and covered with granulations. All carious bone was removed, communicating with the ethmoids and sphenoids. Drainage through the nose and externally in the forehead was established with rubber tubes.

The postoperative course was good. (Fig. 4.) The temperature remained normal throughout. Two days after operation there was slight light perception in the right eye, none in the left. The ophthalmoscope showed marked pallor of both discs, principally in the temporal two-thirds. A course of quartz light therapy was begun. The general hygiene and nutrition were carefully watched, and the patient made a moderate gain in weight. On February 8th, the patient's parents removed him from the hospital against advice. He was next seen on May 17th, when he was readmitted. His mother stated that he had remained quite well until three days before, when he began to suffer severe pain in the head, neck and back, was feverish and became delirious. Examination revealed the patient in deep coma. There was a puffy swelling of the decompressed frontal region. The pupils were widely dilated and did not react to light. There was a slight ocular nystagmus and a divergent strabismus. The neck was very rigid and Brudzinski's sign was positive. The left knee jerk was increased. On the right

side there was a slight Babinski and ankle clonus. The abdominal reflexes were absent. Rectal temperature was 100. Lumbar puncture yielded a yellowish opalescent fluid, under greatly increased pressure. On standing, a pellicle formed, which was stained and found to contain tubercle bacilli.

The operative area was reopened and the dura incised, exposing the brain. Here the caseous process was found to have invaded both hemispheres, causing extensive destruction. Death occurred five days later.

It is our belief from the nature of the extension of the process that it was a primary tuberculous osteitis of the cranial bones, extending secondarily to the accessory sinuses and the orbits. It is possible that the disease began in the sinuses, but the extensive involvement at the time the structures were examined precluded the possibility of determining definitely the site of origin.

From the review of the literature, it appears that some cases of tuberculous sinus disease were limited to the mucous membrane, and in such cases surgical interference was usually successful in removing the process and effecting a cure. In the great majority of cases, including our own, extensive bony involvement was found, and surgery failed to prevent intracranial invasion and death.

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Fig. 1. Before operation.

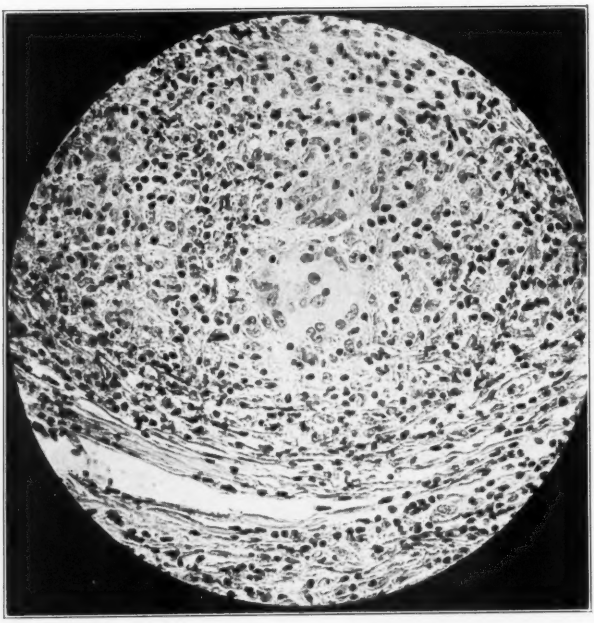

Fig. 2. Tissue removed from frontal and ethmoid region.

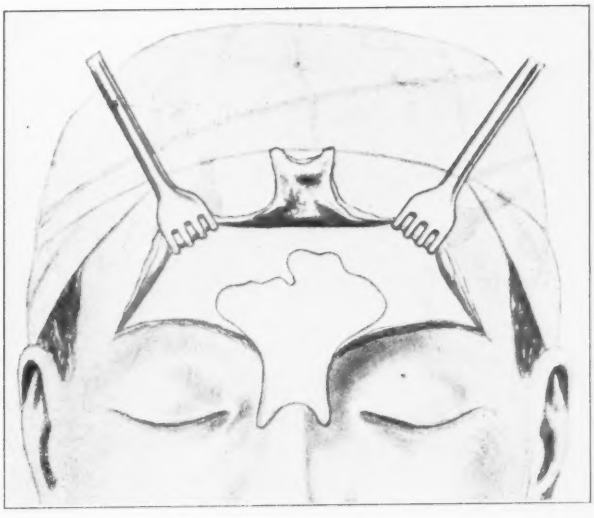

Figure 3.

Fig. 4. After operation.

XCVIII.

THE DIAGNOSIS AND TREATMENT OF CHRONIC ANTRAL INFECTION.

By Ross Hall Skillern, M. D.,

Philadelphia.

Before discussing in detail the actual subject of this presentation, it would be well, as a necessary prelude, to mention the actual conditions which often confront us. In the first place, chronic maxillary sinusitis is unfortunately not uniform in its symptomology, or, for that matter, pathology as well, so that we may have totally different symptoms in apparently similar cases. This apparent paradoxical dissimilarity, however, can readily be explained when one considers the widely different anatomic formations of the lateral nasal wall, with particular reference to the nasofrontal region, the hiatus semilunaris, the pars membranacea with accessory ostia (which, by the way, Schaeffer puts at 20 per cent, double that of his predecessor, Zuckerkandl), and last, but by no means least, the relation of the middle turbinate to these structures. The importance of the middle turbinate is directly as to its proximity to the hiatus semilunaris and to the natural ostium of the maxillary sinus. This is especially marked when there exists a so-called inrolling of the turbinate, thus closing off to a greater or less degree the possibility of a purulent secretion finding its way down under the middle turbinate anteriorly and at the same time obscuring or even preventing the appearance of that cardinal diagnostic symptom of antral suppuration which, of course, is the constant appearance of pus beneath the middle turbinate and the lateral nasal wall.

Let us consider now the actual diagnosis of this condition. When a patient presents himself with a more or less obscure case and no outstanding symptoms pointing to a maxillary infection or, for that particular matter, to any sort of sinus involvement, upon what does the solving of the problem depend? My experience has long since shown me that in this respect there is no royal road which one may take and in ease

and comfort arrive at his destination, or, in other words, by making use of a standard procedure come to an exact knowledge of the pathologic condition of the inside of the maxillary antra. To arrive successfully at this conclusion seems to me to depend upon:

1. The astuteness of the sinuologist to evolve the suspicion.
2. X-ray plates to corroborate the suspicion.
3. The needle to prove the suspicion.

One unfamiliar with this work would immediately say, "Well, why not make a needle puncture at once, thus not only obviating the necessity for the surgeon to be astute and the expense incident to the roentgenologist, but also saving that much time in instituting the proper treatment?" I must admit that by and large, this is a good argument, but, first of all, the suspicion must be present that an infection of the antral mucosa exists, else there is no justification in submitting one's patient to having a needle, even though the caliber be small, thrust through the bony partition of the lateral nasal wall. The principal reasons against its use is, of course, the possible discomfort and dangers connected therewith. Concerning the discomforts, I have little to say, for when properly accomplished it should cause little more suffering than an ordinary hypodermic injection, and indeed in some cases, after a number of punctures, I have omitted using the cocain altogether, at the patient's own request.

Now as to the dangers. While I am aware of the untoward results and even fatalities that have been reported incident to this procedure, nevertheless, feel that, properly executed, this is one of the most painless and harmless pieces of instrumentation that we are called upon to do in the nose; furthermore, as a diagnostic agency it is practically infallible, at least as far as bringing to light the contents of the sinus is concerned. I am naturally referring to the needle puncture under the inferior turbinate. From a diagnostic point of view, then, the inspection of the nares, particularly the middle nasal fossa, followed by roentgenograms, gives us a clue, but, after all, it is the needle that gives us absolute and positive information. If a quantity of pathologic secretion is washed out with the irrigating solution, it could have come from nowhere but the

inside of the cavity, despite the fact that it may have been secreted in the overlying sinuses. If, however, some doubt remains, frequent irrigations will soon disclose its true source of origin.

Accepting, then, that the needle has successfully been introduced and a quantity of purulent matter has appeared in the pus basin and we are reasonably certain that this has been secreted by the mucosa of the maxillary sinus, what other information does this act of irrigation impart?

1. The condition of the sinus mucosa. If directly after the needle has been introduced an attempt is made to ascertain whether the lumen is still free (spicules of bone are apt to cause an occlusion), by cautiously attempting to inject air, one may obtain certain useful information concerning the inside of the sinus, particularly the lining membrane. If the mucosa is greatly swollen it will encroach on the lumen, even reducing the cavity to more or less of a slit. Naturally under these conditions, the end of the needle would remain buried in the swollen membrane and the free passage of the air be greatly hindered. This would be even more apparent when an attempt was made to inject a liquid. Often in this way, by judging the degree of ease in which the injected air or water enters the cavity, one can surmise whether the membrane is swollen or polypoid, and approximately to what extent the lumen is affected. It must also be remembered in applying this test that polyps in the region of the ostium or an inrolled middle turbinate may cause similar symptoms.

2. Character of Secretion.—This, to my mind, is one of the most constantly reliable symptoms we have for judging the severity of the infection and eventually the degree of pathologic involvement of the mucosa. Let us assume that we have, from a prognostic point of view, the worst form of secretion present. This consists of a granular pus, so thin that it mixes with the irrigation solution to give it a milky-like appearance and emits a disgustingly fetid odor. When present it is diagnostic of either an old chronic infection of long standing, with permanent pathologic changes in the mucosa, with osseous involvement or of an empyema of dental origin or both. In any event, the presence of this form of pus, particularly if it con-

tinues even after several lavages, offers the worst prognosis for complete recovery except by a radical operation. If, however, after several irrigations a change is noted in the character of the secretion, its odor markedly begins to diminish, and it begins to take on the appearance of typical masses of yellow pus, it is a sign that the organisms of putrefaction are being crowded out, their place being taken by a less virulent strain of staphylococcus aureus which, from a prognostic point of view, is most desirable.

Certain microorganisms which under ordinary circumstances have a definite specific pathogenicity, change their toxicity when marked variations occur in their surroundings. Oxygen here seems to be the crux of the situation, as it acts as a distinct detoxicant to the germ. In our case this has been brought about by the mechanical cleansing of the normal saline solution, thus helping Nature to throw off the infection. In my experience of the so-called superantiseptics, such as Dakin's solution, acroflavin, mercurochrome, dibromin or any similar preparations give the slightest aid, therefore I have long since discontinued their use. It is true that under certain rare conditions the use of alcohol, from 50 to 95 per cent, or strong solutions of nitrate of silver may become useful, but this phase will be taken up in due time.

If the secretion becomes less and less, naturally the same treatment is continued until recovery; however, as this rarely follows in chronic cases, let us go on to the operative treatment which is, after all, the essence of this presentation.

Let us again suppose that a case presented itself which on diagnostic needle puncture was found to have a maxilla full of fetid granular pus. Irrigation was applied daily, but instead of improvement occurring the patient was remaining at a standstill or growing steadily worse. If, we will say, after one week the condition remains the same, one can almost rest assured the permanent pathologic changes have taken place in the mucosa and we can continue our irrigations until doomsday and still be in the same place we started or even worse. (Very, very occasionally have cases been reported to be cured after many repeated irrigations, in one instance nearly seventy.) One might ask, how could such a condition become worse while

appropriate treatment is being applied, especially when previously it had shown such a tendency to remain at an even course. Simply because the daily introduction of the small needle (much more marked if a trocar is used), by its slight irritation brings on an acute exacerbation and the patient not only has his old symptoms but the new and more distressing ones connected with the active swelling to contend with. When such an eventuality arises we are often in a quandary as to whether to wait until the acuteness subsides or to immediately proceed to surgery. Gentlemen, let me say, in my experience nothing short of a large opening in the nasoantral wall will suffice in these cases, and even then within a few weeks an external radical has frequently been found necessary in order to bring about a 100 per cent cure—and that brings me to the choice of operative procedure. In this discussion we will waive aside those extraneous circumstances, like the wish of the patient, his occupation, systemic conditions, etc., and take the average case, in which our opinion is the court of final resort. What shall be our guiding point as to the exact type of operation to employ? Let us proceed from the mildest case that would require operative interference to the most severe, taking up the actual surgery in the same order.

Before proceeding further it is understood that these cases are of nasal origin. The roots of diseased teeth as a factor in the causation of purulent maxillary sinusitis have been greatly exaggerated. There has always been a wide variation in the claims of different writers, some being as low as 2 per cent and others as high as 100 per cent, but both of these are, of course, under- and over-estimated. My own thoughts had long placed the relation at about 20 per cent, but subsequent experience makes me feel that even this is too high. Perhaps our dental men see the other side of the picture, but it must be remembered if an apex lies in close proximity to the antral floor it can become infected from the antrum which originally was of nasal origin. So that it is like the old question, "Which came first, the chicken or the egg?"

To return to our case: Suppose, then, that after several needle punctures he had cleared up to a point where he was quite comfortable except for the usual morning clearing and hawking and an excessive blowing of the nose. But despite

our endeavors the condition remained stationary, and when for any reason the treatment was interrupted he returned to his original condition with a return of all the symptoms. Obviously here the irrigations helped to such an extent as to bring temporary relief, but were not a sufficient aid to Nature as to allow it to overcome the infection, thus permitting resolution of the diseased tissues. While perhaps great pathologic changes had not taken place in the sinus mucosa, nevertheless conditions within the sinus cavity were such (despite the lavages) as to favor the infection rather than the regeneration.

In this case it is apparent that something more must be done to aid the mucosa in throwing off its infection, and, of course, the two cardinal principles, aeration and drainage, come at once into our mind. Recollecting that the infection was almost conquered by the irrigations alone, it is apparent that only a little further aid to Mother Nature will be necessary. Under the circumstances we use the mildest and quickest operative procedure, which, of course, is an opening in the nasoantral wall, performed through the nose. (Krause-Mikulicz.)

We all, of course, have done this hundreds of times, so that it would be superfluous to detail the method. However, there are several mooted points connected with this procedure which might be of interest.

1. We always make our opening underneath the inferior turbinate instead of above.

2. We never remove any of the inferior turbinate. (This, of course, refers to the bone.)

3. We always use the Wilhelminski spear trocar under gas-oxygen anesthesia, as the whole time required is not over one minute.

The object of this opening is twofold—first, to establish better and lower drainage, and second to permit thorough aeration, which, after all, is perhaps the most important, from a therapeutic point of view. Further treatment consists of daily irrigations with warm normal saline solutions. Improvement is usually noted immediately, and in stormy acute cases within forty-eight hours the aspect of the infection undergoes a complete change for the better with subsequent uninterrupted recovery.

Suppose, however, that while the operation relieved the violent symptoms, the discharge continued and while diminished, nevertheless was sufficient to be of considerable annoyance. We would immediately recognize that such pathologic changes had taken place in the mucosa as to preclude the possibility of regeneration without something more effective than mere aeration and drainage. This is the only place in my experience where another menstruum beside saline solution is of any avail. I refer to alcohol and silver nitrate. Alcohol acts upon the mucosa in a sort of dehydrating manner and at the same time as an antiseptic, and seems to have the power of penetrating which other drugs lack. In any event, the action on the mucous membrane is marked, either one way or the other, and I do not know of a better way to obtain certain indications as to whether further operative measures are necessary. When I say this, I mean that the alcohol, in ascending strengths from 50 to 95 per cent, will either make the condition much better or much worse. If great improvement is noted after one or two injections, and they are continued, recovery will probably take place; if, however, the alcohol seems to cause acute exacerbations and give rise to stormy symptoms, the local condition also becoming distinctly worse, the patient will not recover until the diseased mucosa is removed.

Nitrate of silver, grains 30 to 60 to the ounce, acts in a slower and different manner, seeming to quiet the acuteness and controlling the discharge, but has the weakness, unless steady recovery is taking place, as soon as it is withdrawn the old symptoms gradually return. On this account it is not nearly as reliable as alcohol, as far as aiding in the prognosis.

Now to continue with the case, all these things having failed us, what form of a more radical operation shall we choose? Many men often say to me, "Skillern, how often do you perform the preturbinal method?" I now answer, seldom if ever, and then only because it has been specifically requested.—Why? It is a good piece of surgery and nearly always successful. Well, there is no one reason why I have more or less abandoned it, but a number of them together. In the first place, it weakens too much an important structural part of the superior maxilla to entirely suit me, and secondly, no one knows (in severe cases) the extent of the diseased mucosa, and as

certain parts of the antrum are not amenable to instrumentation through the opening in this method, a complete cure will not follow, thus necessitating a subsequent operation. I had much rather take one of the external radical methods and be perfectly certain as to my permanent result—and this brings me to the choice between these methods, the Caldwell-Luc and the Denker. Each has its advocates, who have found the satisfaction in it that they desired. I have used both many times and find myself now drifting slowly toward the Caldwell-Luc. In my earlier days, the Denker, on account of its radicality and the ease with which it could be done, appealed most strongly, but after reading of that accident where a man who had had a double Denker previously, while chasing his son in the back yard was caught in the mouth by the clothes wire, tearing out completely his hard palate with teeth attached, I must confess my enthusiasm began to wane. I now make use of this method only in those cases where time is a great factor and in elderly individuals, where there has been great reabsorption of the bone. The Caldwell-Luc is more difficult, but it leaves the sinus well protected by bony walls and when properly and thoroughly accomplished leaves, as regards the ultimate results, little to be desired.

XCIX.

A GIGANTIC FRONTAL SINUS REQUIRING EXTERNAL OPERATION: REPORT OF A CASE.

By H. W. Lyman, M. D.,

St. Louis.

This case is reported primarily because it proved to be the largest frontal sinus of which the author has been able to find any record.

A. V., aged 29, received a gunshot wound in the left side of the face, in July, 1918. As a result, reconstruction of the left antrum and part of the nose was necessary. In April, 1925, before the completion of this plastic surgery, the case was referred to the nose and throat service by Dr. Vilray P. Blair, for the elimination of pus from the nasal cavity, as this was interfering with the healing process.

The patient complained of severe pain over and around the left eye and of a profuse purulent nasal discharge. He gave a history of numerous intranasal operations, the exact nature of which could not be determined.

Examination showed loss of part of the left ala and almost complete atresia of the left nostril. The nasal septum was very irregular as the result of comminuted fractures. Large amounts of pus discharged from the left nostril posteriorly. The right side was practically normal, except that the lower turbinate was somewhat enlarged.

April 21, 1925, a plastic operation was done by Dr. Blair to relieve the atresia of the left nostril. The result of this operation was satisfactory, and, on June 1, 1925, the writer did a submucous resection of the nasal septum to correct the intranasal deformity and permit access to the paranasal sinuses. On June 22, 1925, the remains of the left middle turbinate were removed and the left sphenoid and ethmoid cells opened as thoroughly as possible.

As profuse, thick pus continued to pour from the left frontal sinus, and as the patient still complained of severe pain, an external operation was advised on the 3rd of August, 1925. For

various reasons this was not performed until September 30, 1925.

The X-ray plates by Dr. Harry Olin disclosed the enormous extent of the frontal sinuses, extending upward 9 centimeters above the orbital ridge and outward and backward 4 centimeters beyond the outer edge of the orbit, the approximate width of the sinuses being 10 centimeters. The greatest depth of the sinuses from the anterior to the posterior wall was 1.8 centimeters.

They were, however, singularly symmetrical. The writer believes that they are even larger than those described by Schaeffer.[1]

The question of whether it would be possible to remove the sinus contents completely, and what the ultimate result would be, furnished food for much thought. The writer decided to use the method described by Lynch,[2] because this had given better results in his experience than any other procedure.

The essential features of this operation are the careful detachment of the periosteum of the roof of the orbit, including the attachment of the pulley, the removal of the entire floor of the sinus thus exposed, with no disturbance of the anterior sinus wall, the removal of all ethmoid cells and the lamina papyracea.

If complete removal of the sinus contents proved impossible through the floor of the sinus, then additional openings could be made through the anterior wall, but the writer was very anxious to avoid this because of the resulting deformity and the increased possibility of a resulting osteomyelitis.

The operation was scheduled to be done under twilight anesthesia. The patient had been given an injection of one-quarter grain morphin and 1/135 of hyoscin two hours before the operation. This was followed, at forty-five minute intervals, by a second and third injection of hyoscin. When the patient was brought into the operating room he was not sufficiently narcotized, and surgical anesthesia was induced by the administration of ether. As soon as this was attained, the administration of ether was discontinued, and no further anesthesia was required during the entire operation, which lasted more than three hours. Dr. Arthur W. Proetz and Dr. P. H. Finot assisted.

A postnasal plug was introduced, the skin surface prepared with iodin and alcohol, and the eyelids were stitched together with a superficial silk suture to prevent subsequent injury to the cornea. The incision was made in the usual manner from below the inner canthus upward and outward, just below the orbital ridge, through the eyebrow (which had not been shaved), extending to the extreme outer limit of the orbit. The bleeding points were caught and tied with fine catgut; and then the periosteum (including the attachment of the pulley) was carefully detached over the orbital roof. An opening was made through the roof into the frontal sinus, care being taken not to penetrate the mucous membrane lining the sinus. This opening was extended inward in the usual manner and outward to the extreme limit of the orbit, and carried backward until the posterior wall of the sinus was encountered. The orbit was found filled with polypoid tissue and pus, the outer half of the sinus forming a huge abscess cavity with pus under pressure. The contents of the frontal sinus were then removed. This was an exceedingly tedious process, because of the tremendous size of the cavity and the difficulty in curetting the margins of the cavity around the convexity of the frontal lobe of the brain. The Coakley curettes, ordinarily used for this purpose, were too short to reach the boundaries of the sinus cavity, and it was necessary to use uterine curettes with malleable shafts, which could be bent to extend around the convex contour of the inner wall of the sinus, both vertically and horizontally. The breaking down of the septæ in the upper part of the sinus, which, if left, would have interfered with proper drainage, required considerable care and a great deal of time. Fortunately, the posterior wall of the sinus was intact. The removal of the nasal process of the superior maxillary, the lamina papyracea, the ethmoid cells remaining after the intranasal operations, and enlarging the opening of the sphenoid, presented no especial difficulties.

The entire frontal sinus was packed with gauze strips, moistened with 3½ per cent iodin. These were removed after five minutes and a large rubber tube placed in the inner portion of the sinus and brought out through the left nostril. The periosteum was then sutured with interrupted chromic catgut sutures and the skin brought together with interrupted silk

sutures. The suture closing the eyelids was then removed, the conjunctival sac flushed with 10 per cent argyrol, and a vaselin and gauze dressing placed over the eye. This dressing was changed in forty-eight hours, the stitches removed on the fourth day and the drainage tube on the seventh day.

The postoperative course of the case was uneventful, except for its duration, which, because of the size of the cavity, was unusually prolonged.

Three weeks after the operation there was a slight fistula at the inner end of the incision, due to a stitch abscess. This healed in due course and no further trouble ensued.

The patient stated that there was a diplopia on looking down. This persisted for some time, even after ophthalmic examination failed to disclose it.

On July 8, 1926, he was readmitted to the hospital for further plastic work, at which time his sinuses on the left side wree entirely healed, and the writer understands the plastic work was completed to the patient's satisfaction.

When last seen (in the summer of 1928) the nose was free from pus, and the patient stated that the only trouble he had was that his eyes "tired" toward evening if he did a great deal of writing.

There is no deformity except that the sulcus between the left orbital ridge and the eyeball is considerably deeper than on the opposite side.

There has been considerable discussion as to the best procedure in case of a frontal sinus which requires a radical operation, and the statement has been frequently made regarding many operations, including the so-called Lynch procedure, that they are very satisfactory in the case of small sinuses, but cannot be used successfully if the sinus is very large. In the writer's opinion, this case demonstrates that the procedure described by Dr. Lynch can be used with good results on frontal sinuses at least as large as the one here presented.

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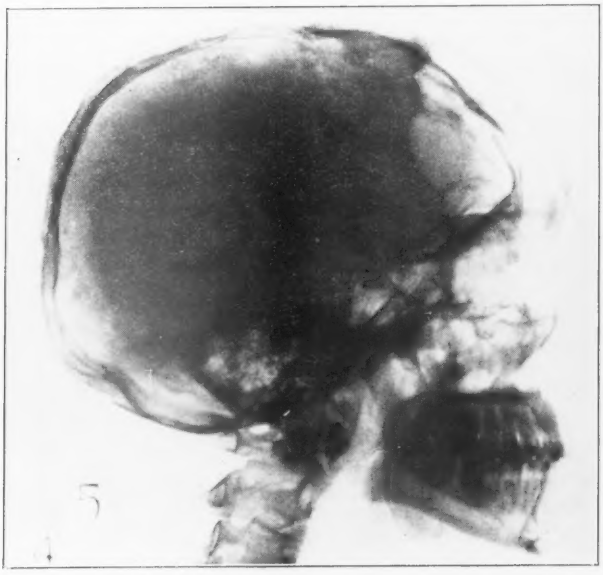

Fig. 1.

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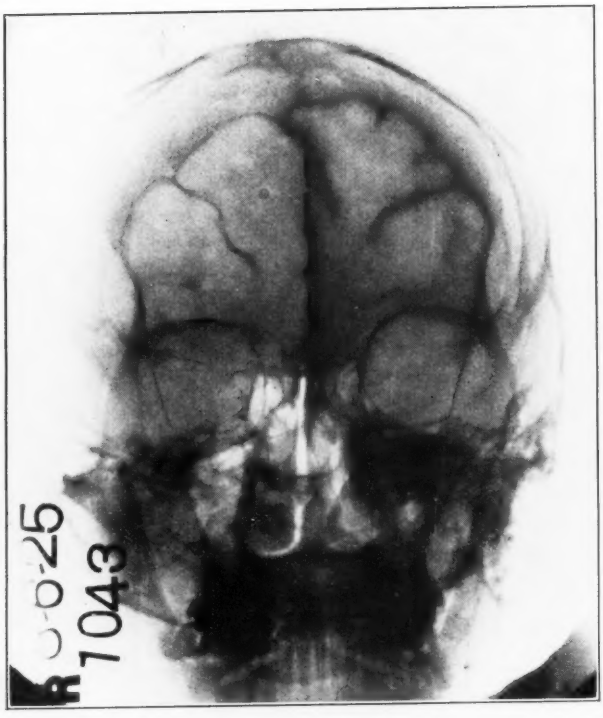

Fig. 2.

C.

A CASE OF ACETANILID ADDICTION WITH CHRONIC NASAL DISEASE AS THE CAUSE: REPORT OF CASE AND REVIEW OF LITERATURE.*

By Charles K. Rose, Jr., B. S., M. D., and
Abram H. Persky, M. D.,
Philadelphia.

Introduction.—The patient whose history is herein reported appeared at the Otolaryngological Dispensary of the University of Pennsylvania Hospital for examination and treatment for a long standing nasal condition. The first inspection of the nasal mucosa revealed a definitely blue mucous membrane, further study showed extensive polyposis, and inquiry revealed the fact that for 20 years the patient had been addicted to the daily use in large quantities of acetanilid via the bromo-seltzer route. The pathology found in the nose was so extensive, the associated conditions so interesting and the result of treatment so satisfactory that the writers believe the story to be worth telling.

This case interested us not only because of its long duration but also because of the nasal-paranasal condition which obviously was the cause of the headaches. Nowhere in our review of the bibliography have we found as prolonged an acetanilid addiction. It seems quite phenomenal that the drug habit had continued over a period of twenty years without the development of more severe symptoms than were manifested by this patient. It is natural to conclude that had the patient's symptoms been properly interpreted and promptly treated his life would have been a more happy one and a more profitable one to him and to society.

Case Report.

History: J. M., a married Russian Jewish male, aged 56, a teacher by occupation, came to the dispensary February 8,

*From the Department of Otolaryngology of the University of Pennsylvania.

1928, complaining of headaches. He gave the history that he had suffered from headache for very many years—in fact, as long as he could remember. He can recall that as a small boy he used hot and cold applications to his head in the effort to get relief. He was unable to obtain medical aid at that time because there was none to be had in the small province in Russia in which he lived. Things continued in this wise until he was about 16 years of age, when his family moved to a larger city, where a physician was consulted and a prescription given him. This medication gave him but temporary relief, the headaches recurring at varying intervals. Each morning he would awake with a splitting frontal pain, which early in the course of the attacks was localized in the central lower forehead.

In 1906, at the age of 34, he emigrated to the United States, and here also he sought medical relief but without success. He would awaken in the morning with a headache so severe that he would be unable to get up for several minutes. In 1908 he began to take small doses of bromo-seltzer for the relief of his nearly constant head pains. A drachm of this nostrum would bring relief for a period of from two to four hours, after which the pain would return but with less severity than before taking the drug. Gradually the initial dose failed of its purpose and the quantity ingested was accordingly increased. From the glabella the headaches now began to spread laterally, and instead of the maximum discomfort being present in the morning only, the pain began to be of continued marked severity throughout the day. About seven years ago, in 1921, the pain area spread from the parietal region to the occiput, where the maximum intensity is now located.

With the increase in the severity of his symptoms he automatically increased the bromo-seltzer dosage until he was taking approximately one ounce per day, or a large sized bottle per week. (A bottle, as dispensed at the neighborhood drug store, contains approximately twelve ounces. As each ounce contains twenty grains of acetanilid, the weekly consumption of the latter was approximately 240 grains.)

Three years ago the patient was compelled to give up his teaching profession because of the increasing severity of his symptoms, and for the past two years his general health has been gradually failing. He is now unable to exert himself with-

out becoming dyspneic, and in addition during the past year he has noticed progressively increasing gastric symptoms, including abdominal distension, the passing of much gas, retching and general gastric distress. The bowels are free. There are no heart symptoms complained of other than breathlessness on exertion and no respiratory or urinary symptoms.

The past medical history is negative, with the exception that in 1923 he was operated on at a Philadelphia Hospital for the removal of polyps from his nose.

The family history is negative except for headaches in his mother and in one of his sons.

General physical examination made after the patient was admitted to the University Hospital for study and treatment. The patient was a gnome-like man, appearing old beyond his years, with the apathetic yet anxious and foreboding expression of one who has suffered chronic pain. His most striking feature was his cyanotic appearance, which was a dark shade of red, between Burgundy and royal purple, and best seen in the ears and lips. Other regions showing abnormal coloration were the mucous membranes, the extremities, the nail beds and the small dilated vessels on the lower chest and upper abdomen. The tongue was heavily coated and red tipped; it was not atrophic or paretic and there were no tremors. The tonsils were atrophic stubs, lying deep in the fossæ and apparently not infected. The mucous membrane of the pharynx was slightly cyanotic. The pupils were symmetrical and reacted promptly, directly and indirectly, to light and to accommodation. The ocular movements were full and equal.

The Chest.—The percussion note was resonant throughout the chest, except at the apices, where it was slightly impaired. Vocal fremitus was slightly increased over the left apex posteriorly. Breath sounds were rather distant. Expiration was somewhat prolonged and feeble. There were no räles.

The heart rhythm was regular and the rate normal. There was a firm pulsation in the fifth and sixth interspace about 1 cm. outside the midclavicular line. There was also a pulsation in the epigastrium. The heart sounds were moderately loud. The first sound was slightly higher pitched and of shorter duration than normal. Over the area of the second right intercostal space a rough systolic murmur and a diastolic murmur

ending in a ringing second sound were heard. The heart area was outlined by percussion 14 cm. to the left in the sixth intercostal space and 5 cm. to the right in the fifth intercostal space.

The abdomen was negative on percussion, palpation and auscultation. The liver and spleen were neither palpable nor enlarged to percussion. There were no neurologic findings.

The urine on four different occasions was deep amber and turbid. Specific gravity ranged from 1018 to 1021. Occasional red blood cells were found and a trace of albumin was present at all times. A few hyaline casts were present, with much mucus and many epithelial cells. A test for acetanilid was asked for, but the quantity of urine was insufficient for the proper technic.

The blood examination showed the presence of 4,260,000 red blood cells per cc., with hemoglobin percentage of 88. There were 7,200 white blood cells. The differential blood count was normal. Blood Wassermann reaction was negative in all antigens. There was no methemaglobin found on spectroscopic examination.

Nasal examination: It was the nasal findings that excited our interest in this case. As we dilated the nostrils we were struck by the peculiar light blue color of the mucous membrane covering the septum and the inferior turbinates. These latter were hypertrophied to such an extent as to obscure the entire nasal interior. On the application of a 3 per cent solution of ephedrine sulphate a better view of the nasal cavity revealed an enormous number of polypi. These were found in both middle meatuses and also seemed to spring from the septum. There was only a slight amount of pus present in the nose. Transillumination showed clouding of the left frontal and left maxillary sinuses.

Examination by nasopharyngoscope revealed nothing except dense polyposis and pus, the origin of the former and the source of the latter not being identifiable with certainty.

Treatment and results: During his stay in the hospital he was subjected to several operative procedures, the local disease being too extensive and the patient too sick to allow of all the work being done at a single session. The operations were performed, under local anesthesia, by Dr. George Fetterolf, Dr. Marshall B. Sponsler and Dr. Edward H. Campbell.

A detailed report of this work is unessential. Suffice it to say that in the course of a two weeks' stay in the hospital the following things were done: Removal of polypi from both sides of the septum and from the middle and lower turbinates of both sides; partial middle turbinectomy of both sides; bilateral anterior and posterior ethmoidectomy, with removal of large quantities of polypoid material from all of these cells.

Two weeks after his discharge from the hospital the patient returned with the statement that he breathed and felt well, and was so free of headches that he had discontinued the use of bromo-seltzer. A week subsequent to this the patient again returned showing remarkable improvement. He was beginning to feel like a normal man. He looked much brighter and the cyanosis had disappeared. The gastric symptoms also had vanished. There had been no recourse to the bromo-seltzer.

Examination of the nose revealed a normal colored mucosa, the blueness having entirely disappeared. There were still present some small areas of mucoid tissue.

ACETANILID POISONING, ACUTE AND CHRONIC.

Much excellent propaganda has been put in motion for the purpose of educating the laity against the indiscriminate use of many of the so-called "nonhabit-forming drugs," particularly the coal tar derivatives. The most widely used of these is acetanilid, which is dispensed to the extent of many tons yearly, not only alone but also in various proprietary nostrums. The deleterious effects of such preparations are well known, and many writers, for example, Austin and Larabee,[1] Sutherland,[2] and Robinson,[3] have expressed their disapproval of the indiscriminate dispensing of these insidiously behaving drugs.

Review of Literature.—In a review of the rather extensive literature on this condition, there can be noted a general accord on the main features, with an occasional case report calling attention to an unusual finding.

Poisoning has been found to occur in either an acute or a chronic form and numerous instances of both are reported.

Acute Poisoning.—Probasco[4] cites two cases in which heightened susceptibility to the drug was present, and symptoms of poisoning supervened in a few hours after the taking of rela-

tively small doses. Summers[5] had a similar experience upon administering eight grains to a patient with frontal headache; alarming symptoms quickly developed, and recovery ensued only after prompt and vigorous stimulation. J. Tyrrell[6] reports a case of acute poisoning in a patient who had ingested a dram of pure acetanilid powder, and Quigley[7] records another which developed a few hours after the ingestion of a dose of bromo-seltzer. Owen[8] and Buehler[9] had cases of acute poisoning, which developed within a few days after the unrestricted local use of acetanilid powder.

Hassen el Arculli[10] recites an incident of a two-year-old female child who became prostrated and cyanotic two hours after having swallowed approximately thirty anti-influenzal tablets, each of which was found to contain 1 grain of acetanilid, ½ grain of quinin sulphate, 1/40 grain of podophyllum and ¼ grain of camphor. It is difficult to estimate how much of the symptoms were directly attributable to the acetanilid, but it is probably safe to assume that the cyanosis and the feeble and irregular pulse were the direct result of the ingestion of that drug.

It would seem reasonable, therefore, in cases of acute cyanosis, with symptoms of collapse, to suspect inter alia acetanilid as the root of the evil and to eliminate that possibility before proceeding to other sources whereby to explain the picture.

Chronic poisoning, unlike acute, may escape detection because the symptoms in some patients are not pronounced.

Herrick and Irons[11] believe that the fact is not sufficiently well known that the long continued use of acetanilid is usually attended by fairly definite poisonous effects. On the other hand, they state, idiosyncrasies exist which allow some individuals to tolerate oft-repeated doses of the drug that cannot be borne by another.

We have found many reports of cases of chronic addiction, and it is notable that poisoning can result from the external as well as from the internal use of the drug. There may be typical symptoms produced purely by the prolonged treatment of a leg ulcer with an ointment containing 10 per cent acetanilid, as reported by Gartman and Ball.[12] Rosenberger's[13] case was very similar. However, by far the greatest number of cases is due to the internal use of the drug, mainly by the prolonged

use of proprietary nostrums for the relief of headache and neuralgic pains.

Symptoms: The onset of the symptoms is often very gradual, and they either mimic other diseases or else are partly obscured by symptoms of the disease for which the drug was taken. For these reasons detection by the physician of the toxic effects often is difficult, and especially is this true when the patient is taking the drug surreptitiously, and persistently denies the fact. Nadler[14] reports the interesting case of a nurse whose complaints ran the gamut of many human ills. Nothing could be determined as to diagnosis, and she persistently denied any drug addiction. Ultimately she was detected using a hot water bag as a medium with which to make her thermometer reading mount skyward, and then she confessed to having used acetanilid powder for the relief of headache and other sinus symptoms for a period of three years. One of Stengel's[15] cases was of a similar character.

The one prevailing symptom that is stressed by all writers is the marked cyanosis, in both acute and chronic poisoning. An exception to this statement is seen in the report of Gilmore,[16] in whose case there was a total absence of cyanosis despite the fact that the addiction had endured for over twenty months. The cyanosis may be either general or confined to a single area, such as the lips, the mucous membranes, the face and neck, the hands, the nail beds or the lobes of the ears, but usually the cyanotic hue involves a combination of the foregoing.

In the majority of cases the bluish tinge alone can be used as a very important and almost determining diagnostic lead. In fact, cyanosis may be the only evidence of the toxic effect of the drug. For example, Strickland[17] cites a case in which the correct diagnosis had been missed and states that the error would not have been made had the intense cyanosis been properly evaluated. In Buehler's[9] case the cyanosis was more intense than that usually observed either in gas poisoning or in asphyxia. Stengel,[15] in two cases with a great many obscure symptoms, found this diagnostic feature a very great aid in arriving at a final conclusion. Jacksch[18] states that he has seen several instances of this character where the poisoning has been acute, and Cabot's[19] chronic case was of this nature.

Gordinier[20] goes further and cites a typical symptom complex characterized by cyanosis, enlargement of the heart, spleen and liver, definite blood changes and characteristic urinary findings. Previous to Gordinier's paper, Stengel and White's[21] excellent article pointed out that cardiac enlargement, hypertrophy or dilatation, as the case may be, both to the right and left, was a constant finding, at least in their cases. They also stated the interesting fact that the cardiac dilatation disappeared on the discontinuing of the drug. Pemberton[22] notes cardiac enlargement and enfeeblement, and Sutherland[2] mentions as quite characteristic general collapse, with weak and rapid pulse. Herrick and Irons,[11] Geopp[23] and Gordinier[20] have all noted increased size of the spleen and liver, which, while not a constant finding, does occur with sufficient frequency to be sought for in all cases of suspected acetanilid addiction.

LABORATORY FINDINGS.

The Blood.—Study of the blood in chronic acetanilid poisoning reveals a very interesting series of features. Much credit is due to Stengel and White[21] for their excellent work on this phase of the matter. These writers emphasized this feature and pointed out as evidence of blood destruction the following: Poikylocytosis, anisocytosis, reticulation of the red cells with normoblasts in preponderance, marked polychromatophilia and megaloblasts, and increase in number and gathering into groups of the blood platelets. There thus seems to be a definite secondary anemia. Herrick and Irons[11] and Geopp[23] verified these observations and also noted leucocytosis. This blood picture is generally agreed upon by the majority of writers, although not all cases were subjected to thorough blood study.

There is marked divergence of opinion as to the presence of absence of methemoglobin as determined by spectroscopic or colorimetric examination. McEllroy,[24] Stewart[25] and a few others report the findings of methemoglobin in the blood as constant in chronic cases. On the other hand, Bachmann[26] came to the conclusion that methemoglobin was not a factor in the production of the cyanosis. Recent experimental work on dogs, by Young and Wilson,[27] seems to determine definitely that acetanilid does not produce methemoglobin changes in the

blood. According to these investigators, the cyanosis is not due, as it has been thought for so many years, to methemoglobin, but to an embarrassed circulation and the presence of p-amino phenol in the alkalin medium of the tissues. This conclusion was confirmed by the finding of p-amino phenol in the urine and blood plasma.

The Urine.—Practically all the authorities agree on constant and characteristic urinary findings. Herrick and Irons[11] have probably made the most thorough and painstaking urinary studies in acetanilid intoxication. They state that the urine is dark reddish, contains p-amino phenol (this fact has been quite recently verified and elaborated upon by Young and Wilson[27]), and shows a marked increase in the etherial sulphates and a decrease in the preformed mineral sulphates. Fr. Miller[28] likewise noted this latter feature. In addition the urine is so uniformly dark as to make this feature a most important diagnostic lead, and it may darken, if free from contamination, even after several days.

Red blood cells, hematin, uroerythrin, urobilin and methemaglobin have all been found. Luce[29] noted that large amounts of albumin are often found, and Cahn and Hepp[30] believe that acetanilid itself appears regularly in the urine of acetanilid addicts.

SUMMARY.

1. Our patient suffered from paranasal sinus disease over a period of 40 to 50 years, with no serious ill effects except pain and physical conditions due to 20 years of acetanilid addiction.

2. For 20 years he was a daily user of acetanilid, a longer time than in any hitherto recorded instance.

3. As is usually the case, symptoms disappeared when the drug was withdrawn.

4. After relief of the nasal disease his drug taking was given up without any difficulty or struggle on his part.

5. Acetanilid addiction has a definite symptom complex, including cyanosis, heart enlargement, definite blood changes and characteristic urine findings.

6. In our case marked cyanosis of the nasal mucous membrane was present, a hitherto unnoted sign.

7. In cases of acute cyanosis with collapse, poisoning by acetanilid or a similarly acting analgesic should always be thought of.

In closing, we wish to thank Dr. George Fetterolf, professor of otolaryngology, for permission to use the department's records and for his kindly advice and constructive criticism, and without whose inspiration this paper would not have been attempted.

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CI.

SINUS RADIOGRAPHY FOR THE PROETZ METHOD OF SINUS STUDY.

By Kenneth D. A. Allen, M. D.,

Denver.

The purpose of this paper is to demonstrate the simplicity of the technic of making X-ray examinations of the nasal accessory sinuses containing lipiodol, in the various head positions which render the most information, as required by the displacement method.

Since Proetz[1] introduced his very simple and harmless technic of placing radiopaque liquid into the sinuses, the X-ray study of this part of the body by means of opaque media has assumed a greatly added importance. It behooves every roentgenologist to familiarize himself with the slight modifications in the usual sinus technic which are conducive of producing the most information by this method. Now opaque media examination of sinuses promises to become as important as similar methods have in other parts of the body.

As in all X-ray work, particularly that endeavoring to show sinus pathology, the technic must be accurate and consistent. It is believed that the requirements set forth by Proetz and Ernst[2] can be fulfilled accurately and consistently with very simple modifications of present technic and apparatus, and more easily carried out than the routine procedure.

They have demonstrated that the vertical position of the head best shows the cell relationship. This, then, requires that the central ray should be maintained in the horizontal position. Thus the fundamental principle of technic modification is to maintain all other factors the same and place the patient vertical and direct the central ray along a horizontal line.

In the writer's brief experience, this modification was so easily accomplished and productive of such satisfactory plates, containing so much added information, that he determined to give a brief description of the necessary apparatus and X-ray

procedure, hoping to encourage radiologists to cooperate in the Proetz method with enthusiasm whenever requested to do so by a rhinologist.

For general routine work, three head erect positions suffice. Occasionally a fourth, head inverted position, becomes advisable. In addition, as Ernst says, views in all the classical positions heretofore used may be useful at times.

APPARATUS.

A 23-degree angle board mounted on an adjustable roentgen table stand, with the table removed (Fig. 1), and a tube stand, which permits a horizontal direction of the central ray, are all the apparatus that is necessary. Most X-ray offices already have the equipment, and mounting the sinus board on the stand is a very inexpensive procedure.

X-RAY PROCEDURE.

Position One (Fig. 2).—The patient is seated with forehead and nose on the angle board, which tips the patient's head backwards 23 degrees from vertical, producing the classical "frontal" position plate when the horizontal ray is passed through the head, about one-half inch below the glabella. A large pillow in the patient's lap, around which the arms can be clasped, increases steadiness. The smallest cone which will show the entire ethmoid and maxillary regions should be used. The factors of exposure, of course, remain the same as when the patient is in the horizontal position. This position causes the "base line" (from external canthus to external auditory meatus) to assume a 23-degree angle to the floor.

Position Two (Fig. 3.)—The angle board is adjusted so that its face is vertical with the floor. The cassette can be placed on the outside, resting on an easily attached ledge at the bottom. This makes a short object-plate distance and reduces secondary radiation. By means of a simple pair of calipers, set at a 23-degree angle, with one leg held horizontal to the floor, place the patient's head so that the "base line" assumes a 23-degree angle to the floor. Also by means of a ruler with a squared end, make sure that both eyebrows are on a line running at 90 degrees to the cassette. Thus the fluid levels in the air cells are maintained in the same relation to the cells

as in position one. Pass the central ray through a point one-half inch below the middle point of the "base line." The same size cone as used in position one at the same distance will show the sphenoid, ethmoid and antra regions.

Position three (Fig. 4).—Patient is seated on a chair, the back of which should be slanted toward the sinus board. Place the crown of the head against the cassette held on the front of the vertically adjusted sinus board. Raise the patient's chin until the central ray passes at right angles to the "base line," through its middle point. The same size cone, at the same distance as used in positions two and three, will show the anterior and posterior ethmoid, sphenoid and antral regions. This position is perhaps the least simple of the three, especially with patients having a short neck. By a little maneuvering, however, making effort to show the anterior ethmoids clear of the superior maxilla, very few failures will be experienced. In rare instances it may be found easier to slant the central ray a few degrees upward. However, the patient's head should always be held so that the fluid will run to the occipital-most part of the cells.

Position four is obvious from an examination of Fig. 5 and the centering, cone and distance are the same as for position two.

CELL IDENTIFICATION.

An interesting method of cell identification can be pursued if reasonable care is used in complying with the outlined fundamental requirements of radiographic procedure.

To recapitulate: (a) Keep the "base line" at a 23-degree angle to the floor in positions one and two. (b) Be sure the central ray is horizontal and passes squarely through the midline of the head in positions one and three. (c) So place the head in position two that the eyebrows are both on a line perpendicular to the cassette. (d) Hold the head in positions one and three so that the saggital plane is 90 degrees to the cassette.

Following the verbal suggestion of Dr. Proetz relative to cell identification, the writer has designed a simple table (Fig. 6), in one end of the top of which is placed a 14 x 17-inch plate glass flush with the surface. Under the glass are two side shelves which just receive the edges of a common 14 x 17 view box,

permitting it to slide in under the glass. The corners of the table at the glass end are made exactly square. The films made by positions one, two and three are placed on the illuminated glass, as indicated in tracing. (See plate.)

By means of a T-square adjusted to the edges of the table, position one film is adjusted at the lower left-hand corner so that the crista galli and the nasal spine of the superior maxilla are on a line parallel to the end of the table.

Position two film is placed at the lower right-hand corner with the "base line" running upward to the left at a 23-degree angle to the edge of the table. In determining the "base line" on the film, the auditory meatus is easily identified. A minute lead marker placed on the patient's temple nearest to the cassette, far enough along the "base line" toward the ear to show well, would make the other landmark.

The sphenoid, if it fills, is always an undoubted landmark. Therefore, place these two films with the inferior border of the sphenoid shadow of each along the T-square edge running lengthwise of the table. Fasten portions of films projecting over the wood surface of the table with thumb tacks.

Finally place position three film in the upper right-hand corner with the line of the palatal process parallel with the edge of the table. The sphenoid again is a landmark, and the occipital-most edge of its shadow is placed on the line of the T-square, passing tangent to the occipital-most portion of the sphenoid in number two film.

Again place the T-square along the inferior edges of the sphenoid shadows of one and two, and move it upward until it aligns the floor edges of the lipiodol shadows in the next two cells of both films. The alignment of known cells in one view can be used to identify uncertain cell shadows in the other.

The same procedure can be carried out with numbers two and three by moving the T-square from the occipital edge of the sphenoids frontally.

When comparing antral shadows in two and three, note that the occipital-most portions of the antra do not contain lipiodol in position two but can easily be made out by following their outline from the surface of the liquid shadow on their floors.

SUMMARY.

1. X-ray technic most efficient for use in the Proetz method of sinus study is not difficult and requires very little new apparatus.

2. If this technic is performed accurately the films can be studied in position relationship to each other to help in cell identification in many cases.

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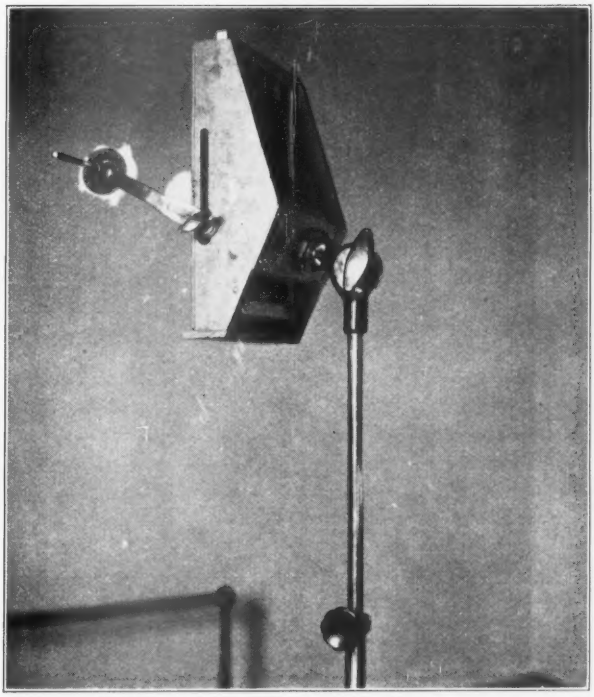

Fig. 1. Commonly used sinus board, adjusted to a stereoroentgen tablestand, for vertical sinus radiography.

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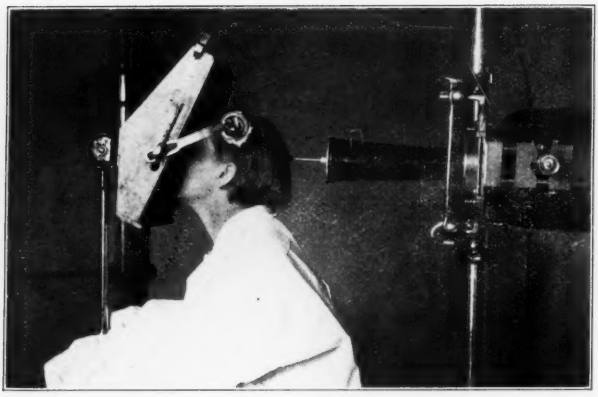

Fig. 2. Showing position "one," differing from usual sinus technique only that patient is vertical and central ray horizontal.

Fig. 3. Position "two."

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Fig. 4. Position "three."

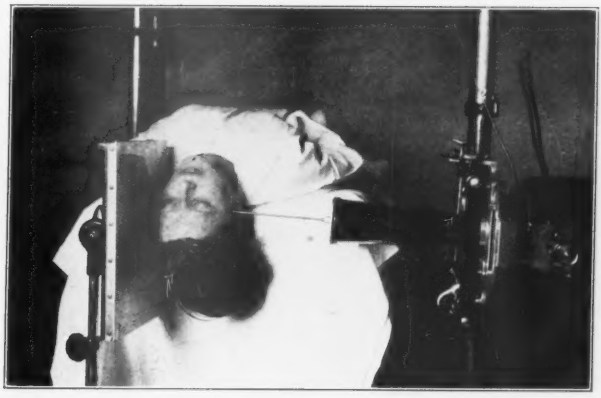


Fig. 5. Position "four."

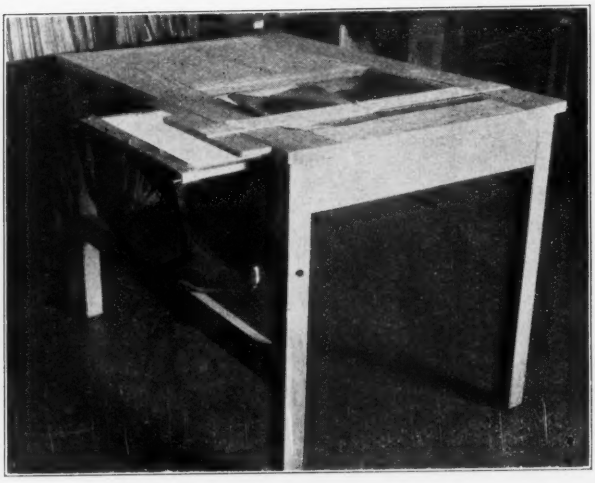


Figure 6.

Legend

E.—Anterior Ethmoid Cells.

e.—Posterior Ethmoid Cells.

R. A.—Right Antrum.

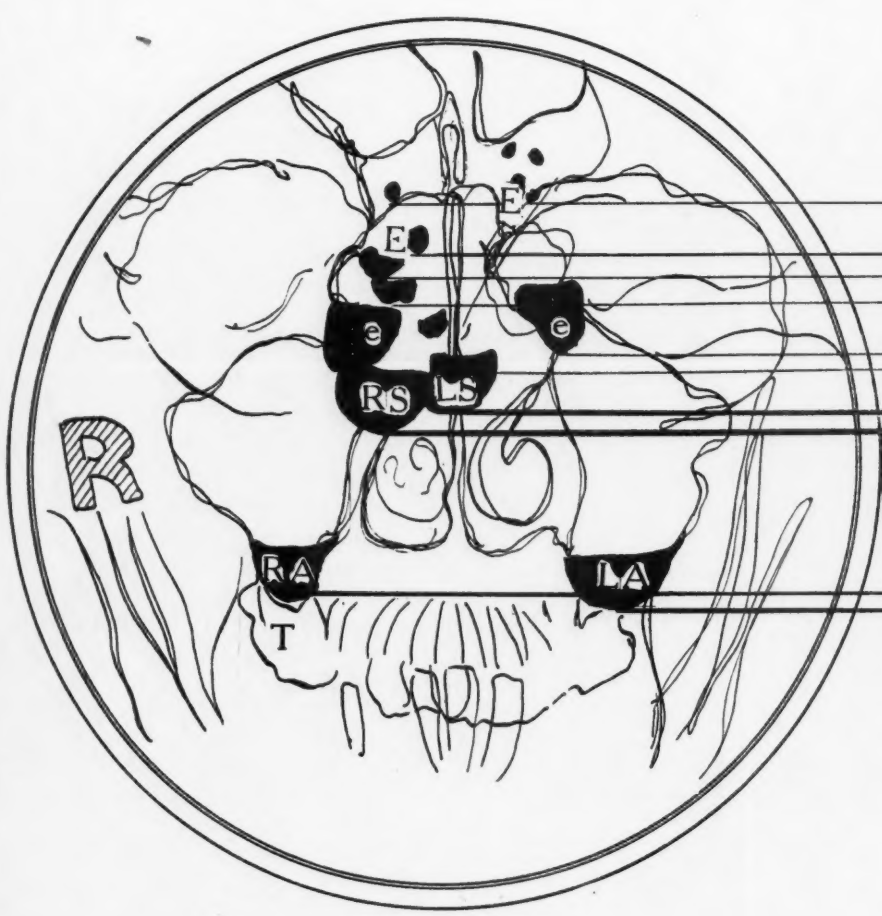
L. A.—Left Antrum.

R. S.—Right Sphenoid.

L. S.—Left Sphenoid.

T.—Tooth.

End of Table

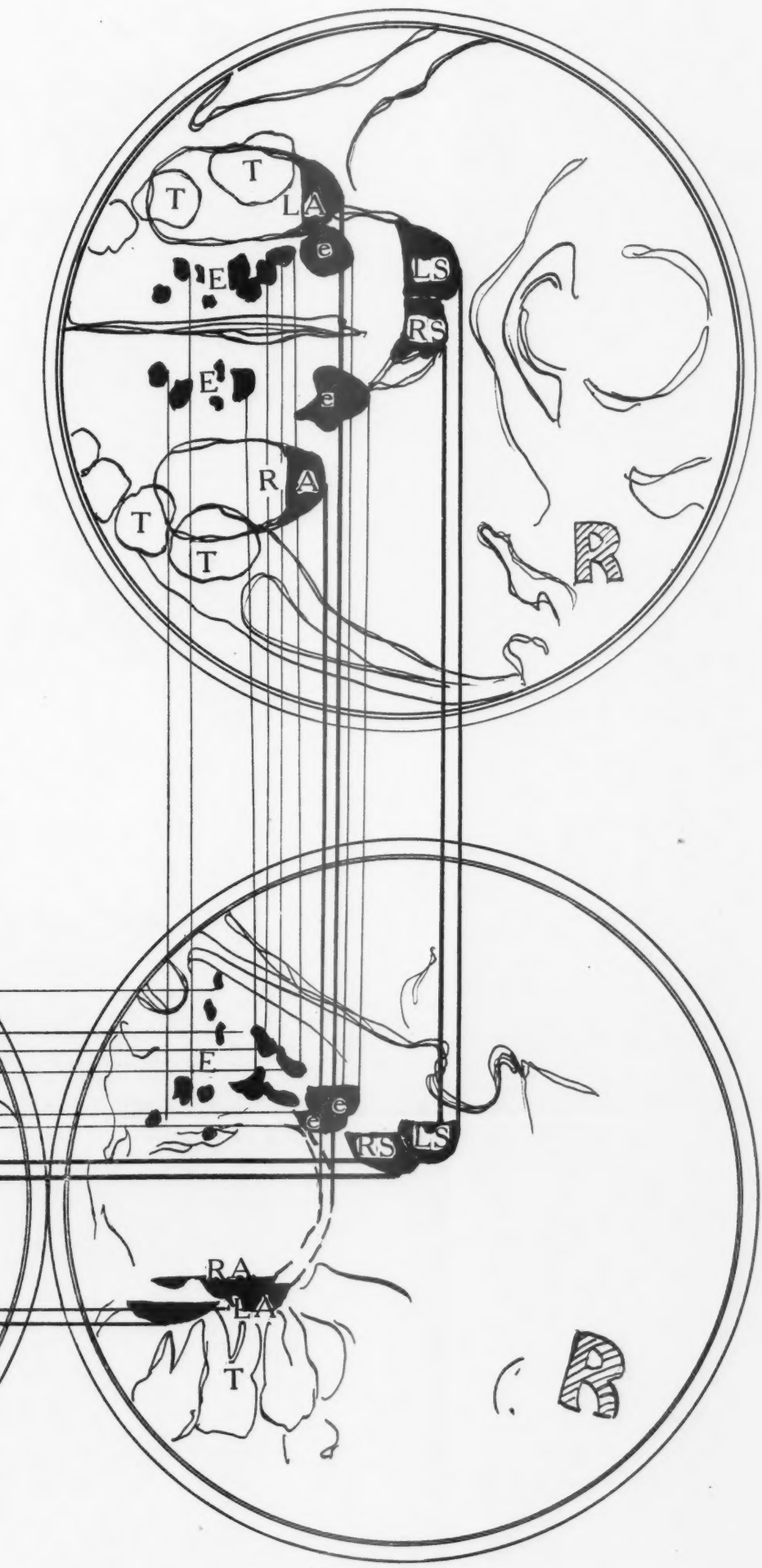


Position One

Side of Tabl

To accompany the article "Sinus Radiology for the Proetz M

Position Three



Position Two

of Table

Proetz Method of Sinus Study," by Kenneth A. D. Allen, M. D.

CII.

REFLEX CONDITIONS ORIGINATING IN THE EAR.

By Louis Ginsburg, B. S., M. D.,

Toledo.

Case 1.—M. P., a ten-year-old girl, was sent to my office June 20, 1927, on account of pain in the left ear. The earache began four days before, was accompanied by fever and had been preceded by sore throat.

An examination made that day elicited the presence of an acute rhinitis. The canal of the left ear was filled with cerumen and desquamated epithelium. This material had a stony hardness, probably due to its long sojourn in the ear. The patient was given instructions to irrigate the ear with soda solution and to return the next day.

On June 21st we learned that the child was subject to attacks of coughing spells. This cough was bronchial in character. The temperature was 101.5° F. and the pulse was 138. Three thorough irrigations with soda solution failed to dislodge the impacted mass.

The patient was told to continue with the soda instillations. She felt better on the 22nd and so did not report at my office until the 23rd. She had had a bad night, with gastric pain and vomiting. The temperature was 99 and the pulse 104. After a great deal of careful manipulation by means of probe, spoon and hook a mass which proved to be a swollen and macerated bean was removed from the ear. The drum was quite red.

Neither the patient nor the parents had any idea of when the foreign body had found its way into the ear. The conclusion I reached was that it had been there since infancy or early childhood, at a time before the child could remember.

That night the patient slept well. The next day her temperature was 99 and the pulse was 112. Her appetite improved. There was no earache. The parents told me, upon further questioning, that the child had had gastric symptoms for about five years. These symptoms were in the form of attacks of gastric pain and vomiting, occurring about once a week.

I did not see the patient again until the 27th. On that day the parents reported that the child was feeling better but had some stiffness in the left side of the neck and pain over the left sterno-cleido-mastoid muscle. The temperature was 99.2, while the pulse was 112. The drum was a little less inflamed and was clearing up in the lower part.

Two days later, the 29th, the temperature rose to 101.2, and the pulse went to 116. The child did not look good. The right drum was negative, but the left tympanic membrane showed moderate bulging and two bullæ upon it. Myringotomy was performed and was practically painless. The myringotome passed through a semisolid substance. There was no spontaneous discharge, but by means of suction a thick, whitish, old-looking pus was obtained. Peroxid drops were ordered for home use.

On July 1st the patient was greatly improved. She had no aural pain. There was still a temperature of 99.8 and a pulse rate of 120. The ear was discharging large amounts of thick mucoid pus.

On the 4th the patient felt worse. The temperature had risen to 100.4 and the pulse to 130. The discharge had ceased prematurely. Myringotomy was repeated. Again the discharge from the middle ear was very thick pus.

On July the 6th the patient was much improved. The discharge from the ear was considerably freer.

This was the last time that I saw the patient. From verbal reports and from letters from the parents I learned that as the ear trouble cleared up the attacks of coughing and the spells of nausea and of pain in the abdomen diminished markedly.

Case 2.—R. P., a 26-year-old woman, came to my office on March 28, 1928, complaining of dizziness and impaired hearing. She had had attacks of dizziness over a period of several years. Every time she moved her head suddenly, especially on rising in the morning, she had a dizzy spell. There was no history of any discharge from the ears.

The summer before, while driving her car, the patient had one of these dizzy attacks and lost control of the car, which ran into a telephone pole. The hardness of hearing which developed later attracted her attention to the ears.

Upon examination, I found both canals impacted with cerumen. By means of warm soda solution irrigations, the cerumenal plugs were cleared out of the canals. Immediately following the removal of the wax the dizziness disappeared.

To prove conclusively the otologic origin of these attacks, I touched a cotton tipped applicator to the drum membrane. In this way I reproduced the condition at will.

The symptoms arising from ear conditions may be divided into two groups: (1) Direct or proximate, and (2) remote or reflex. Among the direct or proximate symptoms are fullness of the ear, diminished hearing or deafness, ear noises and pain. These are symptoms that are readily traced to the ear.

In the case of remote or reflex symptoms we have an entirely different state of affairs. When these reflex symptoms are associated with an active ear condition the relationship may be apppreciated. However, when there are no aural symptoms the relationship is often overlooked and the attention is focused entirely upon the distant organ apparently affected.

The outer and middle ear are supplied with a rich network of nerves. These nerves have numerous connections with other nerves, so that irritation or disease of the ear may provoke symptoms at a distance in the body ordinarily not looked for.

In order to comprehend the mechanism of these reflex symptoms it is well to study briefly the nervous anatomy of the outer and middle ear.

Anatomy.—The external auditory canal receives its sensory nerve supply form the auricularis magnus, auricular branch of the vagus (Arnold's nerve), the auriculotemporal branch of the trigeminus (mandibular branch), and from the sensory fibers of the facial.

The tympanic membrane is supplied by the auriculotemporal branch of the trigeminus, auricular branch of the vagus, tympanic branch of the glossopharyngeal (Jacobson's nerve), the tympanic plexus and the sensory fibers of the facial.

The nerves supplying the mucous membrane of the tympanum are branches from the tympanic plexus formed by the tympanic branch of the glossopharyngeal nerve, in conjunction with sympathetic filaments from the network accompanying the carotid artery.

The chorda tympani nerve traverses the tympanic cavity but gives no filaments to the structures within.

The nerves to the mucous membrane of the eustachian tube are from the tympanic plexus and the pharyngeal branches from the sphenopalatine ganglion.

The nerves to the mastoid cells are ramifications of the tympanic plexus.

Thus we see that the outer and middle ear are supplied by branches of the V, VII, IX and X cranial nerves, and anastomose with branches of the sympathetic system. This situation renders the ear subject to reflexes of the most varied character. An irritation of the external auditory canal, the ear drum or the tympanic cavity may produce symptoms of any part supplied by these nerves and anastomoses.

Respiratory Symptoms.—Cough is the most frequent and best known of these reflex symptoms. This reflex phenomenon I have often elicited by touching the wall of the external auditory canal with a probe or even by the mere introduction of an ear speculum. The presence of a foreign body, of pus or of inflammation of the ear may also provoke cough. In such cases the causal relationship is obvious, as the effect follows immediately and can be reproduced at will. However, there are reflex coughs whose origin is not so apparent.

Professor Max Breitung reports a case of long continued cough, where repeated lung examinations proved negative. On the fourth examination the ears were inspected. A concretion, the center of which was a small round wild-plum seed, was found in the external canal of the right ear. Pressure on the concretion, in attempting to remove it, produced a strong cough. With the removal of the foreign body the cough disappeared.

The same author mentions Arnold's case of a prolonged cough in a girl, due to the presence of two beans in the canal of the ear.

In the same article is mentioned Fabricius ab Hilden's case of cough (associated with epilepsy and hemianesthesia) cured by the removal of a glass bead from the ear.

Breitung believes that the impulse is probably transmitted through the auricular branch of the vagus which supplies the posterior wall of the canal, and which is the centripetal irrita-

tion point for the cough center. Zuckerkandl found also an anastomosis between the auriculotemporal branch of the trigeminus and the vagus in the cartilaginous canal.

Percy Jakins reports a remarkable case of a man who had a troublesome hacking cough for four years, originating from a severe cold. In the last thirteen weeks there was wasting, night sweats, occasional delirium and restlessness at night. Mucous räles were heard over both lungs. Tuberculosis of the lungs was thought of. The patient at the same time was growing progressively deaf. This drew attention to the ears, an examination of which disclosed cerumen in both canals. The cerumen was removed and the same night the patient slept for three hours. Gradually all lung symptoms disappeared and in three months the patient was completely well.

The explanation Jakins gives is that the vagus nerve gives off one branch to the ear, the auricular, and another branch to the larynx, the superior laryngeal. When the auricular branch is irritated the irritation is not rightly localized by the nerve centers, but is felt as if it had been applied to the laryngeal branch of the same nerve.

Hoarseness may also originate in the ear. Mathewson reports a case of a young man who complained of hoarseness and deafness which came on suddenly. One external auditory canal was found nearly filled with inspissated cerumen, while the other contained a small quantity of the same material. From the more completely filled ear a considerable quantity of cerumen was removed. In the deeper part of the canal a large piece of lead (about one-third of an inch long), from a carpenter's lead pencil, was found. The moment this was removed the patient recovered the use of his voice.

Amick reports a case of hoarseness in a woman associated with itching of the ears. Aggravation of the ear symptoms increased the hoarseness. When the ears were better the hoarseness was diminished. The canal walls were found covered with cerumen and were almost closed up. On removal of the cerumen the epithelium was found to be macerated and peeled away. Four months later the patient complained again of hoarseness with a feeling of a mass in the larynx. These cleared up with improvement in the eczematous condition of the auditory canals. Laryngoscopic examination was negative.

Sneezing also may be a manifestation of ear irritation. Amick reports the case of a physician who developed a fit of sneezing every time a speculum was introduced into his ear. Another case, reported by the same author, was autosensitive —that is, the patient could induce sneezing by introducing his finger into his own ears.

Blake and Rotch write about the reflex connection between the ear and the larynx. As examples of this reflex irritation having its origin in this way, the authors mention the hoarseness which sometimes accompanies the impaction of cerumen in the ear and which disappears almost immediately after the removal of the mass. They also relate the case of a young girl who had a persistent laryngeal cough of several months' duration, accompanied by excessive expectoration and extreme emaciation, who was relieved of her troubles by the removal of a bead from the external auditory canal.

The authors explain that the irritation of the sensitive fibers of the auricular branch of the pneumogastric, distributed in the meatus and to the membrana tympani, is reflected along the motor fibers of the superior laryngeal nerve, exciting in the larynx the act of coughing, by causing contraction of the cricothyroid muscle.

The same authors report the case of a three and a half year old patient who had a purulent inflammation of the middle ear and reflex symptoms simulating a pneumonia. The respirations were 75 per minute, the temperature 104 and the pulse 160. The intimate association of the filaments of the pneumogastric nerve with the ganglia of the sympathetic system is the explanation given for the marked pulmonary symptoms.

Foucher mentions asthma as occasionally resulting from ear lesions.

Gastrointestinal Symptoms.—Gastrointestinal symptoms may also arise by reflex influence from the ear. Katz says that "it is a well known fact, and yet neglected by even good gastroenterologists, that any disturbed condition of the ears may cause disorders of the digestive system." He cites the case of a man who for two years suffered from headaches, belching, constipation alternating with diarrhoea, loss of weight, nausea and dizziness. All examinations proved negative, except when finally directed to the ears. These were found full of cerumen mixed with dirt and hardened into a mass which was difficult to

remove. The patient was completely relieved of his distressing symptoms after removal of these plugs.

Kaunitz reports a case of nausea, vomiting, diarrhea, vertigo and weakness lasting twelve hours, which was immediately relieved by puncturing a thin disc of ear wax in front of the drum.

Goldsmith reports five cases. Three had attacks of vomiting. In one of these cases a glass bead was found in the ear. In another a peanut was removed. In the third the symptoms cleared up after the extraction of an apple twig with an attached dead bud. One patient had nausea on rising and was unable to eat much breakfast. This disturbance lasted until one or two in the afternoon. He ate his lunches and dinners without disturbance. Such an atypical history of gastric disease indicated a reflex origin, as was proven by the discovery of bilateral cerumenal impaction. Another case suffered from epigastric pain, nausea and vomiting, which was unaffected by eating. The removal of a large plug of cerumen which completely blocked the right canal cleared up the symptoms.

Goldsmith's explanation of these phenomena is that it is due to irritation of the auricular branch of the vagus, or nerve of Arnold.

Hennebert mentions salivation as a reflex result of ear irritation. He attributes it to stimulation of the chorda tympani nerve.

Sabrazes mentions esophagismus as a reflex symptom.

Loeper and Forestier report epidemic hiccup associated with acute otitis media.

Foucher mentions dysphagia resulting from ear disease.

Nervous and Mental Symptoms.—Nervous and mental disturbances, such as epilepsy, cephalalgia, torticolis, tic or facial nerve and facial palsy, trismus, trifacial neuralgia, convulsions in children, and mental disorders, such as hallucinations, are reported by Hennebert.

Sabrazes and Foucher also mention epilepsy as reflex from ear trouble. In addition, Foucher mentions chorea and hysteria.

Amick reports epileptiform symptoms from irritation due to the presence of a foreign body in the ear.

Allen reports the case of a patient who had lancinating pain in the infraorbital branch of the fifth nerve, due to a hair

irritating the tympanic membrane. The pain disappeared with the removal of the hair.

Wieder reports a case of tic douloureux which was cured by mastoidectomy. The author believes that this is due to the connection between the gasserian ganglion and the auricular branch of the tenth nerve.

Sabrazes says that blepharospasm is sometimes the reflex result of an ear lesion. He also mentions Bourgon's case, which had symptoms of meningitis, with headache, fever, vomiting and vital depression, all of which symptoms disappeared with the removal of a foreign body in the ear.

This author reports a case of right-sided mydriasis, due to a foreign body in the form of an oat in the right external auditory canal. This the author explains as due to sympathetic excitation through anastomosis in the external auditory canal.

Sabrazes also recites Fabrici de Hilden's case of Rosa Chapeyron, who for eight years had a pea-sized glass bead in the left canal. The patient had severe cephalalgia on the left side. There was incessant dry cough and diverse disturbances of the menses. There was a left hemianesthesia which alternated with very lively pains. At the end of four or five years she developed atrophy of the left arm. When the foreign body in the ear was removed all symptoms disappeared.

Watson-Williams asserts that diseases of the ear may lead to mental disturbances, more or less severe. Even so simple a matter as removing a plug of wax has been recorded to have cut short an attack of mania. Some cases of neurasthenia, epilepsy and insanity have been corrected by treatment of aural suppuration or mastoid operation. The authors urge routine ear examination of every subject of mental disease.

Foucher presents a case of hemicrania of the right side, due to a suppurative otitis media of the right ear. The same author reports a case of cephalalgia with vomiting, which resulted from a deeply impacted mass of cerumen in the left canal.

Headaches, too, may result reflexly from the ear. Hammond says that cerumen in the external auditory canal may produce them. Slight obstruction of the eustachian tube in children may produce almost continuous headache. Campbell and Spencer have also pointed out this fact.

N. Papa writes about ear disease as a cause of toothache. Foucher reports a case of catarrhal otitis with dentalgia which was cured by myringotomy.

Cardiac Symptoms.—Verkhovski published an article in which he showed the relationship between disturbed cardiac activity and foreign bodies in the ear. Sabrazes states that an ear lesion may lead to cardiac palpitation.

CONCLUSIONS.

This paper shows that the ear may be a fertile source of reflex symptoms, which may manifest themselves in diverse ways. Such symptoms may present themselves in the respiratory, gastrointestinal, cardiac, sympathetic and central nervous systems. There is here presented, therefore, a broad field for diagnosis.

In cases of persistent cough of obscure origin or in cases of other bizarre respiratory manifestations, the ears ought to be examined as a possible source of reflex irritation.

Cases of reflex gastrointestinal disturbances are not frequent, but probably more so than is suspected. Any case of atypical gastric symptoms should have the ears examined.

All cases of nervous and mental disturbances should have a thorough otologic examination to eliminate foci of irritation which may be productive of reflex symptoms.

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CIII.

BONE PATHOLOGY AND ITS RELATION TO THE PROBLEM OF OTOSCLEROSIS.*

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Research in pathology will succeed only if it is built upon a thorough knowledge of normal conditions. Normal histology is the foundation of histopathology. More particularly research in bone pathology requires a detailed knowledge of the construction of normal bone, which is the end-result of a slow and complicated process. Obviously its final formation cannot be properly interpreted without an understanding of this development. The pathologic changes in the bony system represent a repetition of the individual steps of the normal growth, or they may be enhanced by the addition of new developmental phases. Thus the contested questions of bone pathology are also those of normal bone histology.

What has just been stated concerning the bony system in general is of significance to the pathology of the bony capsule of the inner ear and consequently to the problem of otosclerosis. Research into the etiology of the latter requires a knowledge of the final construction and development of the bony capsule. As far as is known this development, in all probability, follows the general principles of bone formation.

A. The General Principles of Normal Bone Formation.

1. The undifferentiated but potential mesenchyme cells.

The formation of the supporting system of the skeleton originates from special cells of the embryonic germinal tissue

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(Lang, Schaffer). They are spindle cells with a clear nucleus, lying in an intercellular substance (Plate I, 1). According to Roux these undifferentiated but potential cells are destined to provide the skeletal system.

II. THE DIFFERENTIATION OF THE MESENCHYME.

Between these cells the intercellular substance increases and invariably surrounds the cells in situ (Schaffer). Whether the differentiation of the intercellular substances is an active process is not entirely clear. According to Hueck, Herxheimer and others, this intercellular substance is not dead but is endowed with vitality and a metabolism and pathology of its own.

With regard to the skeleton formation there are at least two different types of intercellular substances. Even if one disregards its chemical composition and other properties, it must be recalled that one of them may be stained red with eosin (Plate 1, 2) and the other blue with alum-hematoxylin (Plate I, 3).

III. THE FORMATION OF "NUCLEI" AS CENTERS FOR THE DEPOSIT OF LAMELLAR BONE.

The gradual appearance of two different intercellular substances represents the first step in the development of a center for the subsequent formation of lamellar bone. The second stage is the calcification of this matrix, which as a center may be compared with the starting point of a crystal. For these centers I have chosen the designation "nucleus." Thus two general types of "nuclei" may be distinguished: The connective tissue "nucleus" (eosin-red matrix) and the cartilage "nucleus" (alum-hematoxylin-blue matrix). Since certain differences exist in the course of their development a more detailed consideration becomes necessary.

(a) THE CONNECTIVE-TISSUE "NUCLEUS" (FIBRE-BONE).

The connective-tissue "nucleus" develops, as a rule, as follows: The cells imbedded in situ in the eosin-red matrix take on a jagged appearance. The intercellular substance shows an increased density and stains more deeply in the center. Finally the cells are connected by small anastomoses and the inter-

PLATE I

THE NORMAL DEVELOPMENT OF BONE

I
The undifferentiated mesenchyme cells

II
Differentiation and increasing of the intercellular substance

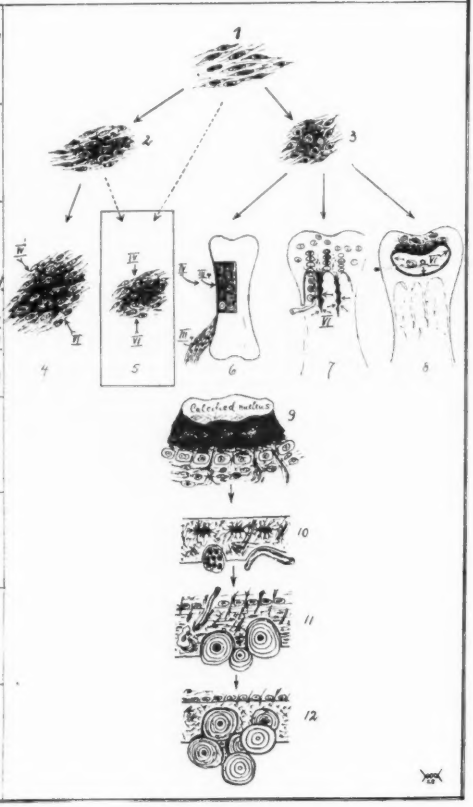
III
Nucleus formation
normal:
4) connective-tissue nucl.
6) perichondral nucl.
7) prim. enchondr. nucl.
8) sec. enchondr. nucl.
[pathological:
5) metaplastic nucl.]

IV
The lamellar fibre-bone formation

V
The resorption of bone

VI
The shell-bone formation

VII
The shell-bone transformation



cellular-substance diffuses to the undifferentiated cells (Schaffer). On the other hand, the fibrils of the surrounding connective-tissue penetrate into the enlarged and compact basic matrix and form there a dense, irregular mesh. As soon as the intercellular substance calcifies, the connective-tissue "nucleus" is completed (Plate I, 4).

The development of a connective-tissue "nucleus" is generally known as metaplastic bone. This designation, however, should be reserved for pathologic "nucleus" formation (as, for example, bone structures in tumors of the thyroid, etc.). The normal connective-tissue "nucleus" formation, as described above, is preferably referred to as calcified connective-tissue (Schaffer), rootstock (Gegenbauer) or fibre-bone (Weidenreich). Such connective-tissue "nuclei" are the starting points of the bones of the skull: os frontale, temporale, squama temporalis, the majority of the facial bones and the annulus tympanicus (Schaffer). Weidenreich, who uses the term fiber-bone, pointed out that it has also been found in the first layers of periosteal bone during its embryonal stage and invariably in the tendinous insertions. In order to avoid confusion the terms most frequently used in the literature for calcified connective-tissue are reviewed in Table I under column A. I have chosen the term connective-tissue "nucleus," since calcified connective-tissue, like calcified cartilage, is merely the first and preceding center of the subsequent lamellar bone. It must be remembered, as Weidenreich has shown, that the formation of the fiber-bone (connective-tissue "nucleus") does not require any special osteoblasts. Thus it stands in a striking contrast with the lamellar bone which, according to its mode of formation, could be called "bone formation by rows of osteoblasts."

(b) THE CARTILAGE "NUCLEUS."

The differentiated mesenchyme cells imbedded in situ in the blue matrix (alum-hematoxylin) are the starting point of the cartilaginous "nucleus" which develops as follows: The imbedded cells enlarge and assume a vesicular structure. Not infrequently several nuclei may be noted in one cell. At first the intercellular substance occupies a small space. In the course of further differentiation the tissue acquires a special form, which already possesses a general similarity to the fully developed

TABLE I.

THE NOMENCLATURE OF NORMAL BONE FORMATION.

	A	B	C
THE AUTHORS	1. THE SYNONYMS OF THE THREE TYPES OF BONE		
Gegenbauer (1864)	Connective-tissue bone (Bindegewebsknochen), interlaced embryonal bone (geflechtartiger, embryonaler Knochen)		
V. Ebner (1875)	Interlaced fiber bone (geflechtartiger Knochen)	Parallel fibrous bone (parallelfaseriger Knochen)	Lamellar bone (lamellöser Knochen)
Kölliker (1899)	Coarse fiber-bone (grobfaseriger Knochen)	Lamellar fibre bone (lamellöser Faserknochen)	
v. Eggeling (1911)	Periosteal bone (Periostknochen)		Marrow bone (Markknochen)
Schäfer (19123	Membrane-bone (intramembranous ossification	Cartilage-bone	
Stöhr 1919)	Connective-tissue bone (Bindegewebsknochen)	Perichondral bone	Endochondral bone
Schaffer (1922)	Direct ossification, primary bone-formation, calcified connective tissue	Perichondral, periosteal bone-formation ("Deck" or "Belegknochen")	Enchondral, endochondral, endostal or intracartilaginous bone

Weidenreich (1923)	Fiber-bone (Faserknochen)	(Fiber bone on tendinous insertions)	Shell-bone (Schalenknochen)
Weber (1928)	Connective tissue "nucleus," fiber-bone	Lamellar fiber bone	Shell bone (true lamellar bone)
	2. THE SYNONYMS OF FORMED STRUCTURES		
Biedermann (1913)			Osteon (Haversian system)
Early authors		Outer general lamellae (äussere Generallamellen	Inner general lamellae (innere Generallamellen)
Weidenreich (1923)		Periosteal lamellae (Periostlamellen)	Osteon lamellae (Osteonlamellen)
	3. THE SYNONYMS OF RESIDUAL BONE		
Gegenbauer (1864)	Rootstock (Wurzelstock)		
Kölliker (1899)		True interstitial lamellae (echte interstitielle Lamellen)	Haversian lamellae (Haversische Lamellen)
Braus (1921)		False interstitial lamellae (unechte interstitielle Lamellen)	True interstitial lamellae (echte interstitielle Lamellen)
Weidenreich (1923)	Rootstock (Wurzelstock)	Fragments of periosteal lamellae (Periostfragmentlamellen)	Fragments of osteon lamellae (Osteonfragmentlamellen)

bone. In fact, the majority of bones have such a "cartilaginous model" (Plate I, 6) as a foundation. The lamellar bone is built on this model as a "nucleus." Since one "nucleus" is formed in the outer (perichondral "nucleus") as well as in the inner zones (enchondral "nuclei"), a more detailed discussion appears desirable.

1. THE PERICHONDRAL "NUCLEUS."

The intercellular-substance between the cartilage cells calcifies on the surface layers of the model. This process terminates the formation of the perichondral "nucleus" (Plate I, 6).

2. THE ENCHONDRAL "NUCLEI."

(aa) The Primary Enchondal "Nucleus."—In order that an enchondral "nucleus" may be formed the following conditions must be present. The cartilaginous "model"* must be opened up by an invasion of blood vessels. For example, in the middle of the cartilaginous diaphysis of a long bone the cells enlarge and appear vesicular. The intercellular substance increases, becomes dense and stains more deeply. It is usually known as the point of calcification. Following this preparatory process blood vessels enter the cartilage model and take with them undifferentiated but potential connective-tissue cells (periosteal bud). As a consequence of this penetration the whole cartilaginous model is hollowed out and the primary marrow-space is the end-result. The formation of the marrow-space, however, ceases at the epiphyses of the cartilaginous models, which leads to the establishment of the well known epiphyseal lines. The intercellular-substance of the cartilage then calcifies (preparatory calcification). The cells arrange themselves in columns, enlarge, become vesicular and lose their cellular nuclei. Furthermore, they are eroded by capillary loops from the primary marrow-space. The calcified intercellular substance remains between the columns and represents the primary enchondral "nucleus" (Plate I, 7).

(bb) The Secondary Enchondral "Nucleus."—The epiphyses of the model remain cartilaginous temporarily but later open up (epiphyseal nucleus, ossification nucleus), and a secondary

*The designation "model" has been described above.

marrow-space appears. In the vicinity of the joint-surface the cartilage persists but it calcifies close to the secondary marrow-space. This calcified cartilage is the secondary enchondral "nucleus" (Plate I, 8). Some investigators believe that the cartilage cells in these areas are transformed into bone cells (metaplasia), while others doubt that this occurs (Schaffer, Borst, Stöhr).

From the foregoing discussion it is evident that four types of "nuclei" may be recognized: (1) The connective-tissue "nucleus"; (2) The perichondral "nucleus"; (3) The primary enchondral "nucleus"; (4) The secondary enchondral "nucleus." The first represents the calcified connective-tissue (fiber-bone) and the three others the calcified cartilage.

IV. THE GENERAL PRINCIPLES OF LAMELLAR BONE-FORMATION.

The lamellar bone is generally laid down on the "nuclei" mentioned above. There is only one mode of lamellar bone-formation, namely, through the activity of osteoblasts, which are arranged regularly, similar to a single row of epithelial cells. At first the excreted form of bone substance is soft (physiologic osteoid) but later it becomes calcified. In the completed bone the osteocytes are composed of the former osteoblasts.

However, according to v. Ebner, Kölliker and others, one may distinguish two types of lamellar bone: the lamellar fiber-bone and the lamellar bone. The former is laid down on the outside of the previously developed "nuclei." V. Eggeling has suggested the term periosteal bone for these layers. The true lamellar bone is deposited from the endosteum on the inside of the marrow-spaces (so-called marrow-bone by v. Eggeling). On the other hand, Weidenreich prefers the designation "shell-bone" (Schalenknochen) for the marrow-bone as well as for the lamellar part of the periosteal bone. In order to clarify the question of the nomenclature the important descriptive names are reviewed in Table I under B and C. In general the writer of this paper has followed the classification of v. Eggeling, who designates any bone, according to the origin of its development, into periosteal or marrow-bone. In accordance with the views of Kölliker, the writer prefers to use the term (a) lamellar fiber-bone for the parallel lamellar part of the periosteal bone (Table I, B) and the term (b) shell-bone of Weiden-

reich for the endosteal marrow-bone of v. Eggeling (Table I, C). It must always be remembered that each shell-bone and lamellar fiber-bone requires a "nucleus" as a foundation.

V. THE FORMATION OF LAMELLAR FIBER-BONE (PERIOSTEAL BONE).

The lamellar fiber-bone is formed on top of the "nuclei" in parallel layers. It is typical periosteal bone and is characterized by numerous connective-tissue fibers and vessels, which are imbedded as Sharpey-fibers and canals of Volkmann. Since the growth of the lamellar fiber-bone takes place on the outside it controls the thickness of the bone. The outer parallel layers are known as periosteal lamellæ.

VI. THE RESORPTION OF BONE.

The "nuclei" and the lamellar fiber-bone are slowly resorbed from the inside simultaneously as growth progresses. The main type of resorption is induced by ostoclasts (Kölliker), which attack the primary bone-material, probably by means of ferments, and thus induce the development of lacunæ (Howship's lacunæ) (Plate I, 10). According to Pommer also vessels may exhibit the ability of resorption by erosion (Plate I, 10). Whether true halisteresis occurs under normal circumstances is as yet undecided (Christeller).

VII. THE SHELL-BONE-FORMATION (ENDOSTEAL BONE).

The shell-bone is a lamellar bone formed by osteoblasts around blood-vessels leading to the well-known Haversian systems. It is exclusively formed from the endosteum upon walls of cavities (Plate I, 11). If the shell-bone on the walls increases, the diameter of these spaces decreases. Since the normal marrow is not fibrous the lamellæ of the shell-bone are free from connective-tissue-fibers.

From the foregoing it is evident that shell-bone may originate wherever vessels are included in spaces surrounded by "nuclei" or lamellar fiber-bone or wherever vessels enter spaces resulting from former processes of resorption.

As growth proceeds the shell-bone takes the place of all the previously formed hard-substances ("nuclei" and lamellar fiber-bone). The shell-bone is the highest unit of bone-formation. Biedermann, who compared the bone-unit with the nerve-

unit, designated the Haversian canals as osteons. In all probability mechanical stimuli influence the direction of the vessels and consequently guide the arrangement of the osteons. The inner layer of shell-bone around the marrow cavity is called the inner general-lamellæ or better "osteon lamellæ of the marrow" (Weidenreich). Since during infantile life shell-bone is principally formed in the epiphyseal line, it controls the growth of the long bones along their longitudinal axis.

VIII. THE TRANSFORMATION OF SHELL-BONE.

In the course of skeletal development the early formed osteons are slowly resorbed. The spaces formed as a result of this process are filled with new shell-bone. According to Weidenreich, the remains of the osteons are designated as fragments of osteon-lamellæ. In advanced age the lumina of the osteons are narrow and finally they may be completely obliterated.

IX. THE END-RESULT OF BONE-DEVELOPMENT.

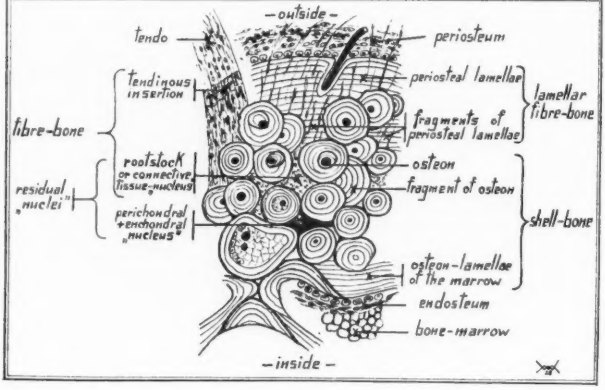
A completed bone reveals a complicated histologic picture which cannot be appreciated if one does not thoroughly understand the various phases of its development. This statement may be best illustrated on a transverse section of a human long bone of an infant (Plate II). It will be noted that an overlapping of all the stages mentioned in the preceding paragraphs is present. The outer or subperiosteal parts are lamellar fiber-bone (periosteal lamellæ), except in those areas in which tendinous insertions (fiber-bone) are attached. Lamellar fiber-bone and tendinous insertions are replaced from within by shell-bone and thus fragments of periosteal lamellæ and fragments of fiber-bone (rootstock or connective-tissue "nucleus") remain. Under certain conditions processes of resorption may lead to the formation of Haversian spaces. Towards the marrow one may observe a conglomerate mass composed of osteons, whole or fragmentary, and the remains of the perichondral "nucleus." Close to the marrow one finds the osteon-lamellæ of the marrow which continue into the spongiosa.

B. THE GENERAL PRINCIPLES OF ABNORMAL BONE-FORMATION.

In general, under pathologic conditions, bone-formation and resorption exceeds the normal rate, but in principal the process

PLATE II

TRANSVERSE SECTION OF A HUMAN LONG BONE
[INFANTILE AGE]



is a repetition of the normal (M. B. Schmidt). However, a few new phases may be observed: the normal apposition may be enhanced by a process known as metaplasia, the normal resorption may possibly be replaced either by halisteresis or by perforating canals. In order to appreciate the abnormal conditions of bone development they must be compared with the normal phases.

I. THE PATHOLOGY OF THE UNDIFFERENTIATED BUT POTENTIAL MESENCHYME CELLS.

Hereditary factors may influence the germinal tissue leading to disturbances in the undifferentiated but potential mesenchyme cells. The latter may lack the ability to form the supporting system required for proper bone development. Dwarfism may be the end-result (nanosomia primordialis). On the other hand, these cells may develop their tendency to form bone in places in which such substance should not normally occur (neoplasm).

II. THE PATHOLOGY IN THE DIFFERENTIATION OF THE INTERCELLULAR SUBSTANCE.

An abnormal appearance and increase in intercellular substances is frequently observed. There may be a direct deposition of soapy material ("Fettkalk," Aschoff) or of a substance which later becomes calcified. Such deposits may follow inflammation, necrosis and disturbances of the protein-fat-carbohydrate or mineral-metabolism. The tissue cells are imbedded in situ. This process may pave the way for "metaplastic" bone formation.

III. THE PATHOLOGY IN THE "NUCLEUS" FORMATION.

(a) DISTURBANCES OF THE NORMAL PROCESS.

Disturbances of the normal "nucleus" formation are mostly due to deficient calcification. A complete absence of lime deposits in the cartilage "nuclei," the etiology of which is unknown, may be seen in chondrodystrophia foetalis. An incomplete calcification in the preparatory zone (see p. 8) is observed in rickets. Deficient calcification of the "nuclei" may also be the result of endocrine disturbances as observed in

nanosomia pituitaria, nanosomia athyreotica. A rapid and increased calcification has been found in gigantism.

(b) THE PATHOLOGIC APPEARANCE OF "NUCLEUS" FORMATION ("METAPLASIA".)

According to Borst, metaplasia represents the development of a fully established tissue into one of a different character. In a general way, metaplasia is a throwback to ontogenetic and phylogenetic phases of development. The question of the metaplasia of connective-tissue into bone-substance is of the greatest significance in the study of otosclerosis and allied conditions. The metaplasia of cartilage to bone has not as yet been proven (Borst).

Personal observations on "metaplastic bone" have shown that the major part of this structure is in reality a calcified connective-tissue "nucleus" surrounded by lamellar bone. Therefore a sharp differentiation always must be made between the pathologic "nucleus" formation and the subsequent enlargement of the "nucleus" by either lamellar fiber-bone or shell-bone. Wherever in the body intercellular-substances, such as hyalin, colloid, collagen, etc., make their appearance as a result of pathologic processes "nuclei" formation may take place provided the substance becomes calcified. Any tissue may thus develop into a center for subsequent bone formation (Plate I, 5). Should such a process occur within the region of end- or peri-osteum in which bone formation is normal the calcification of fibrous tissue should be designated as fibroblastic bone formation (Askanazy, Bauer, Christeller, Gruber).

IV. THE PATHOLOGY OF THE LAMELLAR BONE.

(a) THE FORMATION OF LAMELLAR BONE AROUND A METAPLASTIC "NUCLEUS."

Lamellar bone formation around a metaplastic "nucleus" can occur only if specially differentiated cells are present which can acquire the property of osteoblasts. Such conditions evidently exist in tumors, epulis, in chronic inflammatory tissues and in callus formation. On the outside of the "nucleus" connective-tissue fibers are likewise embedded, leading to a real periosteal lamellar fiber-bone. On the inside, however, where

marrow spaces are formed shell-bone formation occurs around blood vessels.

(b) THE DISTURBANCES OF THE LAMELLAR FIBER-BONE (PERIOSTEUM).

The most frequent disturbance of the periosteal bone is an intensified ossification which increases the diameter of the corticalis. Such conditions may be found during the fetal period in chondrodystrophia foetalis, during youth as a result of hereditary syphilis (periostitis) and in rickets (osteophyte). A thickening of bone during advanced age is mostly due to chronic inflammatory processes, chronic intoxications or venous stasis. It has been observed, according to M. B. Schmidt, as a result of: (1) chronic lung diseases, (2) cardiac defects with venous stasis, (3) syphilis, actinomycosis, leprosy, (4) chronic icterus, (5) tumors (exostosis), (6) phosphorus and arsenic poisoning, (7) leucemic and pseudoleucemic diseases, (8) chronic inflammatory processes of the bone marrow. The newly formed bone is in its first stage a fiber-bone, as Weber has shown in cases of osteomyelitis and syphilis. Thickening of the bone also occurs in the hyperostotic forms of osteodystrophia fibrosa (ostitis fibrosa, Paget's disease). This enlargement is, however, not an autonomous inflammatory periosteal process, as is the case, for example, in syphilis (L. Pick, Wilhelm and Weber).

A reduction of periosteal ossification may decrease the corticalis. It is found in osteogenesis imperfecta (Knaggs, M. B. Schmidt and v. Recklinghausen) and in the two vitamin deficiencies, Möller-Barlow (E. Fraenkel), and scurvy (Aschoff-Koch). Since the endosteal bone formation is also affected, spontaneous fractures may frequently result. According to Pommer, simple decrease of the periosteal ossification rarefies the cortical layers, even if the resorption does not exceed the normal (inactivity, neurotic and senile atrophy).

(c) THE DISTURBANCES OF THE SHELL-BONE (ENDOSTEUM).

In case the bone development remains in the stage of the cartilaginous model and the formation of shell-bone is diminished or entirely absent, dwarfism has been observed. An

early cessation of endosteal ossification has been described by M. B. Schmidt in cretinism. A diminished endosteal bone development is seen in osteogenesis imperfecta, Möller-Barlow disease and in scurvy. A decrease of endosteal apposition induces inactivity, neurotic and senile atrophy. When combined with the absence of periosteal apposition spontaneous fractures may occur.

A very important disturbance of shell-bone formation is its deficiency in calcification, which leads to the apposition of osteoid. This latter tissue is invariably found in natural and experimental rickets (MacCollum, Stepp and György) and in osteomalacia, and may be present or absent in osteodystrophia fibrosa (Askanazy, Christeller). While the new formed bone is soft it induces, for example, the osteomalacic pelvis or bow legs in rickets. Disturbances in the costo-chondral conjunction leading to the formation of a rosary are not specific for rickets, since they have been observed in osteodystrophia fibrosa of animals by Christeller and in scurvy by Wimberger.

The shell-bone is influenced by the conditions existing in the bone marrow. Inflammatory processes of the marrow and venous stasis produce a proliferation of the endosteum which may close the marrow cavity, as seen in cases of syphilis or osteomyelitis. In this regard also the osteodystrophia fibrosa is of the greatest importance. Here the bone marrow is transformed into fibers. Islands of fibers calcify, forming connective-tissue "nuclei" (fibroblastic bone). Very often, however, they do not completely calcify, thus giving rise to the fibroblastic osteoid. In these cases the shell-bone formation may be entirely absent, as personal observations have shown on polished sections made from specimens of a hyper-ostotic-porotic form of osteodystrophia fibrosa. The first sign of healing is the beginning of shell-bone formation, which can exceed the normal to such a degree that it may lead to sclerotic bone which may be as hard as ebony (Christeller). Eburnization is also common in the course of other chronic processes, such as chronic syphilis and osteomyelitis. In fact, the narrowing and calcification of the Haversian systems may be so extensive, even at an early age, that the vessels become completely obstructed.

V. THE PATHOLOGY OF RESORPTION.

(a) DISTURBANCES OF NORMAL RESORPTION.

Increased resorption of bone substance by ostoclasts is one of the most frequent disturbances of resorption. It is a common process in the inflammation of bone, in the invasion of tumors, in pressure atrophy (hydrocephalus, aortic aneurysm), in the resorption of calluses and in functional changes. An increase of the activity of ostoclasts also occurs in the hypoostotic form of the osteodystrophia fibrosa.

(b) THE APPEARANCE OF NEW TYPES OF RESORPTION.

1. Vascular Resorption.—M. B. Schmidt believes that the penetrating canals are a sign of resorption because the vessels proceed recklessly through the bone and also through the shell-bone; Axhausen, Christeller, Weidenreich and others, however, are of the opinion that the vessels are retained in the bone substance (canals of Volkmann) and are therefore the result of apposition. In any case, as Pommer has pointed out, the vessels are endowed with the ability to erode bony substance by means of their walls.

2. Halisteresis.—By halisteresis is meant a diffuse decalcification which Recklinghausen calls "trypsis" and believes to be a factor in osteomalacia. According to Axhausen, Konjetzny, Lang, Looser, Pommer and Schmorl, it is questionable if such a process really exists. Christeller, however, observed it in the neighborhood of an echinococcus cyst, and Gottlieb in the diffuse atrophy of the alveolar bone. Since technical methods are not available to prove either decalcification or incomplete calcification, the final decision must remain in abeyance.

C. THE NORMAL GROWTH OF THE OSSEOUS CAPSULE OF THE LABYRINTH.

I. THE NORMAL DEVELOPMENT.

The bony labyrinth is formed upon a cartilaginous model. To avoid repetition this development is presented in the form of a scheme (Plate III and Table II), which is based upon the work of Eckert-Moebius, described in the handbook of Henke-Lubarsch (Volume XII). Eckert-Moebius follows the monographs of Meyer, Wittmaack, Kosokabe. It has been the aim

of the writer especially to consider German publications dealing with bone pathology in order to present to American readers some of the more recent contributions in this field which have not as yet been generally reviewed.

II. THE NORMAL STRUCTURE.

The final state of the bony capsule is seen in VIII and the advanced stage in IX of Plate III and Table II.

D. Otosclerosis.

I. THE MORPHOLOGIC PICTURE.

The cause of otosclerosis, which is the subject of our investigations, is unknown.

The views regarding its usual genesis (histogenesis) are not in accord, but the end-picture of otosclerosis, as seen in a histologic section, is well known. Politzer was the first to express the view that otosclerosis is an idiopathic disease of the bony labyrinth. The term otosclerosis better describes the process than "progressive deafness." On this account the pathologist prefers the designation "otosclerosis" rather than the purely clinical expression, "progressive deafness," since, according to Lange, only a few cases with otosclerosis lead to clinical deafness.

Otosclerosis is a focal disease, which is usually bilateral. The resulting deafness may occur in several ways, the most frequent having its seat in the middle ear, due to ankylosis of the stapes. The other type is due to a pressure atrophy of the auditory nerve as a result of encroaching processes of the bone. As a result of the latter an inner ear deafness may develop.

In some cases middle ear deafness may be combined with inner ear deafness. According to Wittmaack, processes on the endosteum may change the Ca-ion-concentration of the fluid of the labyrinth and thus induce lesions of the end-cells of the auditory nerve, which may result in inner ear deafness without pressure atrophy of the nerve.

The histologic picture, according to Lange, is characterized by the following: In the focal lesion one may note an intermingling of fibrous and lamellar bone; interglobular spaces are

PLATE III

THE NORMAL DEVELOPMENT OF THE BONY CAPSULE OF THE LABYRINTH AND THE OTOSCLEROSIS

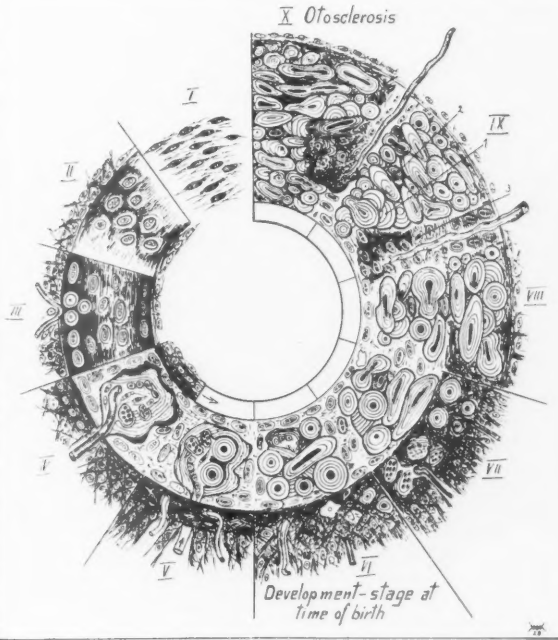


Table II.

THE NORMAL DEVELOPMENT OF THE BONY CAPSULE OF THE LABYRINTH.

EXPLANATION OF PLATE III

		The Outer Layer: Periosteal Ossification	The Middle Layer: Enchondral Ossification	The Inner Layer Endosteal Ossification
I		Stage of Undifferentiated Mesenchyme Cells		
II		Undifferentiated mesenchyme cells	Differentiation and increase of intercellular substance. Formation of the "cartilaginous model"	Undifferentiated mesenchyme cells
III		Preparatory calcification of the intercellular substance on the outside of the cartilaginous model (perichondral "nucleus")	Cartilaginous model	Preparatory calcification of the intercellular substance on the inside of the cartilaginous model
IV		Beginning of the fiber-bone formation	Opening of the cartilaginous model through a periosteum-bud and building of large marrow spaces. Preparatory calcification and building of the enchondral "nucleus." Beginning of shell-bone formation upon the enchondral "nucleus." Resorption of the primary formed material	Formation of a few layers of calcified connective tissue (fiber bone) on the inside

V	6-7 fetal month	Continuous formation of fiber bone	Continuous shell-bone formation. Transformation of primary and lymphoid bone marrow into fat marrow	
VI	Development stage at time of birth	Finished fiber-bone formation, which stains red with eosin	Advanced shell-bone formation. Small marrow spaces filled with fat marrow	
VII	Development during the 1-2 year	Intensive resorption of the fiber-bone (ostoclasts). Filling of resorbed spaces by compact lamellar bone. Fragments of periosteal lamellae between the new-formed shell-bone.	Progressive building of shell-bone. In the cartilaginous partitions. Replacement of the cartilaginous partition before the oval window by lamellar bone	
VIII	Juvenile stage	Hard, compact shell-bone	1. Hard, compact shell-bone, with a great number of vessels 2. Resistance of interglobular spaces 3. Permanent cartilaginous partitions	
IX	Adult and senile stage	Sclerosis of the shell-bone with narrowing of vessel spaces	Calcification of residual cartilage. Early signs of age. Sclerosis of the shell-bone with obstruction of the vessels	

absent. Having recognized this fact, it is quite evident that the entire anatomic problem of otosclerosis is one of bone pathology which can be solved only if one keeps in mind the development and formation of normal bone.

The foci in the bony capsule are sharply defined against the enchondral labyrinth by means of a cementum line. The surrounding bone of the middle layer shows no changes. In fact, the focus rests in a self made space between the enchondral and periosteal bone. The primary process of the disease is, in all probability, one of resorption, which proceeds slowly towards the periosteal bone. There is, however, no limitation to the periosteal bone. Furthermore, it is of paramount interest that the foci occur in selected places and most frequently in the region of the fenestra ovalis.

II. THE THEORIES OF OTOSCLEROSIS.

The principal theories of otosclerosis consider the problem from the standpoint of bone pathology.

Siebenmann was the first to explain the foci in the bony capsule as processes of "neospongification." This interpretation is readily understood if one compares the foci with the secondary marrow space formation of the long bone. In otosclerosis the areas are later filled with unorganized bone. Brühl and Wolf consider otosclerosis as a process of exostosis which in turn may be compared with the tumor-like fiber-bone formation not infrequently observed in the long bones. Lange and O. Mayer see in the otosclerotic process a tumor-like hypertrophy on the basis of a hereditary, localized tissue malformatoin. To be sure, Mayer compares it with neurofibromatosis and proposes the designation osteofibroma or osteofibromatosis. Manasse blames early inflammatory processes as the cause of otosclerosis, since he found leucocytes in the otosclerotic foci. In his monograph (1912) he has chosen the term "ostitis chronica metaplastica"; this indicates the importance of the metaplasia problem in its relation to otosclerosis.

According to the review given by Drury, disturbances of the endocrine glands, inflammatory processes and possibly rickets may be responsible for otosclerosis.

Wittmaack, taking an entirely different viewpoint, considers localized venous stasis, which may produce halisteresis, as the

cause of otosclerosis. The correctness of his view may be verified by a consideration of the principles underlying halisteresis and disturbances in the periosteal processes due to venous stasis. In this connection one may recall the phlegmatoplastic malacia of v. Recklinghausen.

The relation of the cartilaginous remnants to the otosclerotic foci is suspected by Bast, Manasse, Stötz. On the other hand, O. Mayer is of the opinion that the cartilage remnants around the fenestra ovalis are less important than the cartilaginous partitions. It is in these areas that the connective tissue processed radially and produces fibrous bone; the end-result is again a "metaplastic" process.

Alexander believes that otosclerotic foci may already be present in the newborn, or even in the fetus. He found typical otosclerosis in a cretinous dog.

In this brief sketch an attempt has been made to illustrate the intimate relationship of bone pathology to otosclerosis. Progress made in the former will unquestionably enhance our knowledge of the latter. But since otosclerosis is not merely a problem of pathology, any progress which may be made in the various branches of biology will undoubtedly help to clarify the many mysteries with which the field of otosclerotic deafness is surrounded. To solve the problem, as Fraser and Pritchett have repeatedly pointed out, one needs the close cooperation of all the specialists concerned.

The otologist must conduct a specialized examination of the ear, collect detailed histories of every case of otosclerosis, including such data as previous infectious diseases, hereditary, dietary and environmental factors, etc. Next the internist should study the otosclerotic patient in order to establish any relationship between otosclerosis and general disturbances in the body as a whole. Then the biochemist must study the metabolism of the deafened in order to discover if a specific disturbance in the Ca and P ratio may induce the process. The pathologist finally studies the morphologic changes in the ear and in the other organs as well. He must examine the whole bony system in order to determine whether changes in the skeleton parallel those of the labyrinth.

Unfortunately, this deductive analytic method of investigation has its limitations, since suitable clinical material for a complete study is rarely available. Not infrequently, a case studied thoroughly by the clinician and biochemist cannot be investigated by the pathologist, since only an incomplete autopsy may be permitted. It therefore appears advisable to produce the disease experimentally. By this means the effect of various factors on the bony system as a whole, and on the labyrinth in particular, can be studied under carefully controlled conditions. In order to correlate clinical findings with anatomic lesions it is of the utmost importance that a standardized method be devised, if possible, by psychologists for testing the hearing of the various animal species used in otologic investigations.

Should it be possible to reproduce otosclerosis experimentally excellent leads for the therapy would be secured.

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CIV.

LARYNGEAL STENOSIS.

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It is understood that stenosis of the larynx is a clinical phenomenon and not a disease, and can be correctly studied only by reference to the pathologic conditions which cause it.

Laryngeal stenosis may be acute or chronic, so mild as to interfere little with the comfort of the patient, or so severe that life may be lost if relief is not promptly given. It is not possible to make a complete study of all of the causes that produce laryngeal stenosis. My intention is to emphasize some of them in connection with the methods used for their relief.

Any condition that causes laryngeal edema may cause acute laryngeal stenosis. Acute narrowing of the larynx occurs in syphilis, wounds, scalds, foreign bodies, acute laryngitis, septic inflammation, diphtheria, membranous laryngitis, exanthemata and other acute phlegmons of the larynx. Phlegmonous inflammation of the pharynx may involve the larynx by extension, causing laryngeal stenosis. It has been known to occur suddenly in chronic tuberculous laryngitis. Congenital laryngeal stridor, congenital webbs or recurrent laryngeal paralysis may cause stenosis. Imperfectly performed tracheotomies, when the incision is made too high, may cause stenosis by interfering with the action of the cords. An intubation tube that is worn too long may cause ulceration of the larynx and thus lead to stenosis. For this reason an intubation tube should be removed as soon as possible, preferably not later than the third day. It is estimated that 1 per cent of the patients intubated for laryngeal diphtheria are subsequently unable to breathe without an intubation tube, or tracheotomy tube, on account of subglottic laryngitis. Cicatrization following perichondritis is a frequent source of chronic stenosis. Rheumatism causing an ankylosis of the arytenoid joint will cause chronic stenosis. The same may follow typhoid fever, diphtheria or other infectious dis-

eases. The most frequent source of laryngeal stenosis is ulceration in the tertiary form of laryngeal syphilis.

Laryngeal stenosis may develop gradually, as in the case of tumor of the larynx, tuberculosis of the larynx, laryngeal perichondritis, wounds and injuries. Surgical trauma, such as produced by galvanocautery, may cause acute or chronic laryngeal stenosis.

Fracture of the larynx may cause laryngeal stenosis. I have seen such a case in a young fellow who was struck over the thyroid cartilage with a baseball bat. The case was seen two days after the accident, at which time there was slight tenderness, swelling and hoarseness and paralysis of the abductor on the right side, but no difficulty in respiration or deglutition. The larynx was slightly edematous, but in the absence of threatening symptoms the patient was put to bed on expectant treatment and observation for developments. After a week in the hospital he felt much better and became displeased with the imposed restrictions and left the hospital without permission. About a week after leaving the hospital he suddenly developed asphyxia, violent dyspnea and was rushed to a hospital for an emergency tracheotomy. We have not seen the case since the tracheotomy, but have heard from a reliable source that he made a good recovery.

St. Clair Thomson says that a fracture of the larynx is attended by a mortality of 27 per cent. Death in these cases is not caused only by obstructive asphyxia, but by cardiac inhibition and emphysema of mediastinum, bronchopneumonia and septicemia. The cases that recover may be left with permanent stenosis requiring the wearing of a tracheotomy tube. Some writers recommend that a tracheotomy be done in all cases of fracture of the larynx and not wait for dyspnea to develop. An early tracheotomy in such cases has the advantage of putting the fracture at rest and at the same time forestalling sudden asphyxiation.

One case of a small child, who placed his open mouth over the spout of a boiling kettle, covers my experience of scalds causing laryngeal stenosis. The patient was seen a few hours after the accident, at which time there was a marked stenosis as the result of acute edema. Intubation gave prompt relief and the patient made an uneventful recovery.

Many acute forms of laryngeal stenosis tend to spontaneous recovery. Cases due to diphtheria or the impaction of foreign bodies are always serious. When a tuberculous or a malignant disease is the cause of stenosis it is necessary to resort to tracheotomy. Chronic laryngeal stenosis has no tendency to spontaneous recovery, and if it is progressive death by asphyxiation is expected unless averted by tracheotomy. The cure of chronic laryngeal stenosis is acknowledged to be a rare and difficult accomplishment. The question is raised by no less an authority than St. Clair Thomson whether it is better to subject a patient to a long and tedious process in the treatment of chronic laryngeal stenosis, with uncertainty of a successful result, or to recommend the life wearing of a tracheotomy tube.

There are three chief methods for the relief of laryngeal stenosis:

(a) Medication and intralaryngeal treatment.
(b) Intubation.
(c) Tracheotomy.

In syphilitic laryngitis, even when the process is advanced and respiration is embarrassed, prompt relief will follow antiluetic treatment. In tuberculous laryngitis with stenosis, relief usually comes from rest in bed and silence. However, if in luetic or tuberculous laryngitis dyspnea is distressing, the patient should be afforded relief by tracheotomy.

In the months of October and November, 1927, we had under our care six cases of acute laryngeal stenosis. Three of this number were cases of laryngeal diphtheria. There was no epidemic of diphtheria prevailing at this time, and the cases came from different localities. One case was spasm of the larynx, one foreign body and one edema of the larynx following a goiter operation. In the goiter case tracheotomy was done, and after wearing the tube three days the patient could breathe comfortably without it. There was no further dyspnea after the third day.

The foreign body case was that of a boy, 3 years old, with a kernel of Indian corn in his larynx. The case was seen by the family doctor, who doubtless saved the child from immediate death by opening the larynx. In the haste and confusion which usually attends such occasions the doctor made his incision through the thyroid cartilage, introducing an antrum cannula,

in the absence of a tracheotomy tube, and sent the child by auto thirty miles to our office. He informed me to this effect: "I have just seen a child with a grain of corn in his larynx. I have cut his throat, and am sending him to you. Be on the lookout for him." On his arrival, the patient was dyspneic and in the state of shock. The antrum cannula was a poor substitute for a tracheotomy tube and allowed only a limited amount of air to enter the lungs. The corn kernel was coughed out when the antrum cannula was removed. The bronchoscope was introduced and both lungs were found to contain much blood.

With the aid of suction and forceps, the lungs were freed of clots and blood. A tracheotomy was performed, and the primary wound was sutured. The patient enjoyed complete relief from dyspnea, but two sources of danger still threatened him. The most imminent source of danger was the sudden development of pneumonia from a great amount of blood accumulated in the lungs, and a more remote danger was laryngeal stenosis as the result of an improperly placed primary incision. Septic pneumonia was evident about twelve hours after the operation, and the symptoms increased in severity until death occurred on the third day as the result of septic pneumonia.

The case of laryngeal spasm was that a of boy, seven years of age, who gave the history of having had three former attacks of violent dyspnea at intervals varying from six months to a year. One of these attacks had been diagnosed as diphtheria. Antitoxin had been administered, and the child recovered from dyspnea in about forty-eight hours.

On another occasion diagnosis was made of diphtheria, and antitoxin was administered and an intubation tube introduced. Diagnosis of diphtheria was made, not upon the laboratory report, but upon suspicion, as the patient had a sore throat and temperature, but no laryngeal investigation was made in either case. At the time I saw this patient he had been ill for twenty-four hours, had a rapid pulse, temperature 102, stertorous breathing, pronounced dyspnea but no cyanosis. Laryngeal examination revealed mild congestion but no edema or membrane. The larynx was in the state of spasm. A competent chest man was asked to see the patient in consultation, and after a thorough investigation we decided that it was a case of atypical asthma. One-sixteenth grain of morphin was given

hypodermatically, which promptly relieved the patient of dyspnea, and the patient was free of fever on the following day, and there has been no recurrence of the symptoms since then.

Three other cases of stenosis referred to above are cases of laryngeal diphtheria. One of these cases was brought to the hospital in apparently moribund condition—extreme cyanosis. A rapid tracheotomy was done, and artificial respiration and inhalation of oxygen were successful in resuscitating the patient. The patient was able to dispense with the tube after the sixth day and made an uneventful recovery.

The second case of laryngeal diphtheria was that of a child, 3½ years of age, who had been ill for four days. Respiratory distress had been present for twelve hours. The child was not cyanotic but dyspnea was pronounced. Under local anesthetic a tracheotomy was performed, which gave immediate relief to dyspnea and the child improved from day to day, but was not able to live without the tube for about thirty days. During this time there was much edema of the larynx, and each time the tube was removed and the trachea wound occluded the air passage was blocked. It was three weeks before the patient was able to tolerate with comfort a partial blocking of the tracheotomy tube, and from this time on more and more blocking of the tube was tolerated from day to day until the patient was able to wear the tube with the lumen entirely blocked for twenty-four hours. The tube was then removed, and the patient has continued to enjoy an open airway and recovery was complete.

The third case of laryngeal diphtheria had complicating nephritis and general edema. This patient was suffering from pronounced dyspnea of one day's duration. General edema, incident to nephritis, was so great that it was with difficulty that tracheotomy was performed, as the child was of the short, stocky type, and the swelling of the neck was so pronounced that the landmarks were greatly obscured. This child gave the impression of being in a hopeless condition from the beginning, but in order to relieve the extreme asphyxia, if possible, tracheotomy was done, and when the trachea was opened the air still failed to enter the lungs. The child died in about twelve hours, presumably from tracheobronchitis. No postmortem was made.

Tracheotomy and intubation are the dependable measures to be employed in relieving laryngeal stenosis. Which of these measures is indicated, and how much delay is warranted in carrying out the chosen method is a question of great concern. The opinion seems to prevail that tracheotomy is the method of choice in dealing with obstructions due to infectious diseases and in cases where prolonged rest of the larynx is the chief requirement. In obstructions due to trauma, intubation may be the choice over tracheotomy. In severe laryngeal obstructions, tracheotomy is the better procedure.

In cases of chronic laryngeal stenosis much time and patience are required, if successful results are to be obtained by the process of dilatation. As, in constrictions in other regions, dilatation must be continued until it is apparent that the space is ample for physiologic purposes; then the patient should be observed from time to time, and if there is a tendency toward contraction further dilatation should be attempted.

Dilatation is best carried out by putting the patient in a state of laryngeal suspension and introducing the largest possible rubber covered intubation tube that can be placed in the larynx. This should be worn for several weeks and replaced by another tube of larger size, and so on, until the maximum size tube is in place.

In cases of chronic stenosis requiring dilatation a previous tracheotomy has been performed, and the tracheotomy tube should be worn during the period of dilatation. The tracheotomy opening, in addition to affording the patient an easy breathing space, is also used as a route of approach to the larynx from below upward, and in this way sounds may be introduced in the larynx from time to time and thereby assist in overcoming the stenosis.

CV.

FACIAL PARALYSIS ASSOCIATED WITH ACUTE OTITIS MEDIA.*

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The appearance of a facial paralysis in the course of an acute otitis media is very uncommon when we consider the number of acute ear cases encountered. Otologists with very large clinical experience may see but few cases, if any, during their entire career. Less than 1 per cent of all otitic suppurations are accompanied with facial nerve involvement. In 70 per cent or more of peripheral facial palsies the etiology is doubtful and commonly ascribed to exposure to cold or infective neuritis. MacKenzie points out that many statistical cases have not had adequate ear examinations and states that probably many of those cases of unknown origin would have been accounted for by a careful otologic examination. G. A. Boyd, in his report upon 188 consecutive cases of acute otitis media and mastoiditis in which the Swartze operation was performed between the years 1914 and 1919 lists but one case which was complicated by facial paralysis. Kopetzky stated that facial paralysis was present in 3 per cent of 126 mastoidectomies performed in the acute coalescent type of ear cases. B. Danelius found that among 700 cases of mastoid operations in acute otitides facial paralysis was present in seven, or 1 per cent.

Clinically, facial paralysis is divided into a central and peripheral variety. The central type includes the paralyses which are produced by a lesion of the neurones and axones above the facial nucleus in the pons.

The peripheral, those which are due to a lesion of the nucleus or of the nerve distal to it. Most facial paralyses are of peripheral origin. The seven cases reported by Danelius were all of

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peripheral variety. Those of central origin occur chiefly through intracranial complications of otogenic diseases.

The mode of involvement of the facial nerve in acute otitis media cannot be determined with certainty, but may be calculated from a study of their anatomic relationship. The outer wall of the fallopian canal containing the facial nerve as it crosses the inner wall of the middle ear cavity is often almost membranous in thinness and sometimes actually has an hiatus in its bony continuity. There are other openings in the bony wall between the canal and the tympanic cavity, such as those for the passage of the chorda tympanic nerve, the branch from the facial to the stapedius muscle, and the tympanic branch of the stylomastoid artery. It is thought that these offer avenues for the spread of the infection.

Paralysis of the facial nerve is brought about either by direct involvement of the nerve and its sheath or by the pressure of the exudate within the fallopian aqueduct or by pressure from the tympanum. Ulceration and caries of the wall may take place even in the acute stage. According to Politzer, dehiscences in the fallopian canal do not necessarily produce facial paralysis, because in caries and necrosis of the walls of the cavum tympanum the facial nerve has been found lying free in the tympanic cavity completely surrounded by pus without symptoms of facial paralysis having existed. From this he concluded that it must be pressure on the nerve within its bony canal which produces the paresis. Hawley demonstrated four dissections in which the facial nerve was displaced; in two of them the nerve lay in the path one must cut when cleaning out the mastoid. He suggested that these malpositions of the nerve may account for paralyses seen. However, the reported findings of otologists who have operated on cases of facial paralysis in acute otitides did not disclose any such displacements.

Ney finds his experience with a great number of infected war wounds demonstrated that an intact nerve trunk is very resistant to surrounding suppurative processes, but the nerve is susceptible to the influence of apparently minor degrees of compression. The anatomic peculiarity of the facial nerve—i. e., its course through a long bony canal, which it entirely fills and to which its sheath is intimately attached, is

such as to convert even slight vascular changes into definite compressive factors, whereas nerves not confined by a bony casing would not be affected by such changes because of the elasticity of the surrounding tissue. He further writes it is apparent that congestion, hemorrhage or pressure of mild inflammatory exudates within or without a nerve sheath in an unyielding bony canal could produce functional disturbances. The firm attachment of the sheath of the nerve to the periosteum of the facial canal tends to localize these compressive factors rather than allow their spread along its course. Moreover, he adds, a concomitant periostitis of the facial canal is probably the explanation of many of the facial palsies associated with otitic disease. A. W. Adson takes the same viewpoint.

In children and infants a facial paralysis occurring at onset of an acute otitis media or before rupture of the drum is indicative of a tuberculosis, as in the case of Jones, described later.

Few actual cases of facial paralysis with acute otitis media are reported in the literature. A. Roth reports a case of a robust man, 28 years old, when first seen on the third day of an acute otitis media, had a homolateral facial paralysis. He operated the next day and found extensive destruction of the mastoid. The sinus plate and bony roof of the mastoid and tympanic cavities were not involved. There was no evidence of exposure of the facial nerve in the posterior wall. Ten days after operation the facial nerve had entirely recovered its function. Galvin Young of Glasgow, in November, 1921, was called to attend a doctor who had an attack of influenza with a right ear complication. He found the tympanic membrane red, but there appeared no fluid in the middle ear; there was slight tenderness at mastoid tip; temperature was 100° F. Advised palliative measures. Improved, mastoid tenderness disappeared and by the seventh day hearing was normal. On the eighth day he developed a well-marked homolateral facial paresis. As he displayed no other symptoms of moment, he was treated expectantly. The condition remained stationary for two weeks and then commenced to clear up slowly. Given galvanic current. Facial paresis disappeared in one month.

Wallerstein describes a case of a woman, 53 years old, who had spontaneous rupture of the right ear drum with discharge,

tinnitus and impaired hearing but no pain. Two weeks later a facial paralysis developed on the same side. There was no pain, no mastoid tenderness but sagging of the posterior superior wall. He did a radical operation 21 days after onset of ear trouble. Found few cells along the posterior wall necrosed with pus; no direct connection to facial canal was discovered. Facial paralysis was gone after ten days. He, therefore, concluded that the paralysis was due to edema within the fallopian canal. Bowers reports a very unusual occurrence in a boy of ten who after daily temperature of 99 to 100° for one month developed a right-sided facial paralysis, although never had any pain in or discharge from the ear. Operation revealed a mastoid filled with granulations and pus, with much necrosis about antrum and tip. The paralysis cleared up in two weeks. E. B. Jones had a case of a boy five years old, with history of glandular tuberculosis, who had intermittent ear pains with a facial paralysis developing on the twelfth day. The drum was incised and a serous bloody exudate followed. The paralysis lasted ten days, the ear discharge four weeks. Robert Sonnenschein reported one case of acute otitis media wherein a facial paralysis occurred on the tenth day. He considered such a complication an urgent indication for operation.

A. Noah Schiller reported a complete facial paralysis following an infection of the external auditory canal in a woman, 65 years old. It is apparent that an otitis media subsequently developed with a mastoiditis. A radical mastoid was done under local anesthesia. The facial palsy began to improve three weeks after and within three months disappeared. Ernest Culpin described a case of a male, 32 years old, who ten days after a submucous resection of the septum developed a peculiar feeling in the right side of the face with pain at the root of the nose. Shortly afterwards pain was felt in the right ear and in 24 hours it discharged. Within a few days the ear discharge and paralysis became less evident, so operation was delayed. Paralysis and discharge disappeared in a very short time. Kopetzky reports a case of facial paralysis occurring on the fifth day of a postgrippal otitis media in a child, seven years old. At operation, aside from a coalescent process, nothing was found to account for the paresis. Child made an uneventful recovery.

The diagnosis offers no difficulty. The paralysis comes on gradually and is well marked within twelve hours. Severe pain in the ear and side of face may precede its appearance, but in most cases no pain is experienced. The paralysis is usually ushered in by slight twitchings of the face muscles. When fully developed the patient has a peculiar drawing sensation in his face, which leads him to feel something is wrong. Examination discloses a relaxation of the facial muscles on the paralyzed side and a contraction of the muscles on the sound side, thereby producing a very striking facial expression. On the paralyzed side the angle of the mouth is motionless, the skin of the cheek lacks its normal tension, is relaxed and puffs out during respiration. There is loss of voluntary movement of the skin of the forehead and some lagophthalmus with tearing on same side.

According to E. B. Jones and J. H. Leiner, if the lesion of the nerve is limited in extent its site in the canal can be determined as follows:

1. Involvement of geniculate ganglion alone manifests itself by a herpetic eruption in the external auditory canal and outer ear with severe neuralgic pains in the ear (Hunt's syndrome).

2. If above the geniculate ganglion, the sense of taste is not disturbed.

3. If above the point where the chorda tympanum takes its departure and below the branch to the stapedius muscle, the sense of taste in the anterior one-third of the tongue on the same side is affected with excessive flow of saliva.

4. If above the twig to the stapedius there is in addition severe tinnitus and hyperacusis.

The prognosis in this type of case is very good, although recovery of the palsy may be extremely slow. Peripheral facial fibers show a high tendency to regenerate. Even in cases of long standing the outlook for regeneration of the fibers is favorable if the cause is removed. Complete disappearance of the paralysis usually occurs in from ten days to six weeks.

The treatment of facial paralysis with acute otitis media is primarily that of the ear condition per se. Free drainage from the middle ear must be maintained and operation is not indicated unless frank findings of mastoid involvement exist.

Voorhees advises that a slight facial paralysis with retained faradic excitability occurring in the course of an acute otitis media may be treated conservatively if it shows a completely normal course—that is, normal temperature, no pain, no mastoid symptoms, no sagging of the posterior superior wall and increased hearing. In all other cases immediate mastoid drainage should be instituted. Wallerstein considers facial paralysis as a relative indication for operation in acute otitis media and an absolute indication in the chronic cases. Mygind regards the paralysis as an absolute indication for operation but not as an infallible sign of osteitis. Denker holds the same view, while Heine and Alexander consider that the question of operation is only to be decided by a consideration of the case as a whole. Leon E. White states that it was the procedure at the Boston Ear Infirmary to operate early on patients who developed facial paralysis associated with acute otitis media. Now such cases are treated conservatively.

When we analyze the cases reported above we note that in those wherein surgical intervention was instituted the paralysis cleared up much sooner than in those treated conservatively. Radical procedures, as practiced by Wallerstein and Schiller, are not justified. A simple mastoidectomy appears sufficient to give results. No actual dehiscences in the bony wall were found in any of the cases. It appears that most of the cases complicated by facial paralysis are definite surgical mastoids and require operation regardless of the complication. Occasionally a facial paralysis will occur in an acute otitis media without an osteitis and in such an operation is not essential. Among the seven paresis cases operated upon, mentioned by Danelius, in two osteitis was not present; in two, osteitis was present to a slight degree, and in three osteitis was marked. He concludes that since it is not possible to exclude in such cases the presence of serious bone disease, the paralysis should be regarded as a definite indication for operation. This view he feels is supported by the fact that in five of the seven patients the paralysis began to clear up immediately after the operation so that a causal connection between operation and improvement was obvious.

Study of the literature and my own limited experience lead me to conclude that in this class of cases the treatment is essen-

tially that of the ear condition per se and that the paralysis as a complication is not necessarily an indication for operation.

REPORT OF CASES.

Case 1.—Miss R. B., 25 years old. Past history unimportant; never had any ear trouble. On April 2, 1924, after a few days' cold in the nose, she developed severe pains in her right ear. On advice of her family physician she used hot compresses to that ear for two days, when the drum ruptured spontaneously with a profuse thick pus exuding from the canal. At this time she developed nausea and vertigo to a degree that she was unable to move about comfortably. I saw her on the fourth day at which time examination disclosed a tremendous amount of thick pus oozing from the right canal; no fever; no tenderness over the right mastoid; a fair sized perforation in the posterior inferior quadrant of the right drum; spontaneous nystagmus to the left; past pointing left arm to the right; no Rhomberg; vertigo and ataxia, with some nausea, and very little hearing in the right ear. I enlarged the opening in the drum. Patient refused to be hospitalized. She phoned me three days later that the vertigo and ataxia were gradually disappearing and that the discharge from the ear was still considerable with no pain or fever. On April 15th, or eleven days after the ear began to discharge, I was again called to see her on account of a peculiar feeling she had in the right side of her face. I found a complete right sided facial paralysis, a third degree horizontal nystagmus to the left, profuse discharge from the ear, sagging of the posterior superior wall of right canal, no mastoid pain or tenderness and no fever. The paralysis began in the evening with a few twitchings of the face muscles, and was well marked on awakening the next morning. She was removed to the Mt. Sinai Hospital. Urinalysis was negative; blood findings were: hemoglobin 65 per cent, R. B. C. 4,400,000, W. B. C. 14,400, neutrophiles 70 per cent, S. M. 26 per cent, L. M. 4 per cent, Wassermann negative. The X-ray showed a cloudiness over the entire right mastoid area, together with a breaking down of the intercellular partitions. Dr. Noah Schoolman saw this patient in consultation. On April 19th, a simple mastoidectomy was performed, Dr. Schoolman assisting. There was considerable pus in the mas-

toid and antrum, and practically all cells were broken down. The lateral sinus was not exposed, as its bony covering appeared normal. No dehiscences in the fallopian canal could be found. Smears and cultures revealed the streptococcus mucosus capsulatus. Patient made an uneventful recovery. At the time of her discharge from the hospital, on May 1st, or twelve days after operation, the ear discharge was greatly decreased, the facial paralysis less marked, slight spontaneous nystagmus to the left, no vertigo, with Bárány noise apparatus in good ear; heard loud shouting only in affected ear. The mastoid wound was healed in five weeks, the paralysis disappeared in five weeks and the ear discharge in seven weeks. Three months after operation the right ear was entirely deaf. Caloric test demonstrated an inactive vestibular apparatus on the right side.

Two years later she consulted me on account of a swelling behind her right ear of three days' duration. Examination revealed a soft, boggy infiltration in the operated mastoid area. The canal was free of discharge but the posterior superior wall sagged. There was no spontaneous nystagmus, no pain or tenderness, no fever and no dizziness. A small incision brought out thick pus. With a totally inactive labyrinth, there was a question of choice of operation, whether a radical or labyrinthine procedure. Dr. Schoolman, on again being consulted, advised a radical mastoidectomy, which he performed with the writer assisting. No dehiscences were found in the bony canal wall or in the horizontal canal region. The patient made an uneventful recovery. The loss of hearing was permanent. Caloric test indicated an inactive vestibular labyrinth on the side operated upon.

COMMENT.

In this case the infection, which was of a very destructive type with no fever or mastoid pain, is characteristic of the behavior of the mucosus capsulatus organism. The ear findings alone, regardless of the facial paresis, made absolute indication for operation. Coincident with the mastoiditis was a diffuse purulent manifest labyrinthitis, which, now that the cochlear function is gone, has become a diffuse purulent latent one. No direct connection with the facial nerve was found. Therefore, it appears that the paralysis of the facial nerve re-

sulted from compression within its bony canal by inflammatory exudate within or without the nerve sheath.

Case No. 2.—Miss L. G., 22 years old. Past history: Measles in childhood, influenza in 1918; was five weeks in bed with loss of voice for a few weeks, followed by a low voice for a few months. Tonsils removed five years ago; occasional mild sore throat since; never any ear trouble. In 1922 she fell from a street car; was unconscious for one-half hour; in bed at home two weeks; has had headaches and dizziness intermittently since this accident; attacks of headache are very severe and last from a few hours to a week; had few fainting spells during attacks of dizziness; no convulsions or twitchings. On May 26, 1924, while at work she developed severe pains in her left ear. A few days' head cold preceded the ear attack. In the evening there occurred marked bleeding from that ear, and bleeding continued despite packing in ear and ice packs. I saw her on the third day after ear attack began. I found a steady oozing of bright red blood from the left ear canal and was unable to make a good otoscopic examination. The family physician who referred the case informed me that on the previous night she had such severe pains in the ear that he gave her a hypodermic of morphin for relief. Hearing tests showed a middle ear involvement; temperature 100°; some pain over mastoid on pressure. I packed the ear with xeroform gauze. The next day the discharge was serosanguineous in character and less in quantity. The left drum, which was bulging, had a pinpoint perforation in its anterior inferior quadrant. Incised the drum for better drainage. I did not see the patient again until June 1st, or six days after onset of ear trouble, when I was called on account of a peculiar sensation she had in the left side of her face. Examination disclosed a complete left-sided facial paralysis; temperature 100.6°; ear discharge unchanged; some mastoid pain. I advised hospitalization, which was objected to. Dr. Schoolman was then called in consultation and also advised her removal to the hospital. Admitted to the Mt. Sinai Hospital same day. Urinalysis was negative. Differential blood count gave W. B. C. 22,000, neutrophiles 80 per cent. X-ray showed a cloudiness of left mastoid, but cellular partitions appeared complete; hearing appreciably reduced. On June 4th a simple mastoidectomy was performed, Dr. School-

man assisting. Under the periosteum the bare bone appeared bluish color. On removing cortex found diploetic cells filled with reddish blue clots; some granulations in the antrum; no frank pus present; sinus covering appeared normal, and no dehiscences could be found in the posterior wall. Smears and cultures showed many white cells but no bacteria. Patient made an uneventful recovery. She was discharged June 15th, or eleven days after operation. Two weeks later the ear was dry, hearing normal and facial paralysis gone.

COMMENT.

This case presented two unusual interesting features: 1. The profuse hemorrhage coming on so early in the ear disease and lasting almost three days, and (2) a facial paralysis. Hemorrhage from the ear may follow an injury or fracture about the ear, or rupture of the internal carotid artery into the middle and external ear from a tubercular process, or from puncture of the internal jugular vein when anomalously protruding into the hypotympanum. In the last instance there is an outpour of venous blood. The only vessel in the tympanic cavity of moment is the stapedius artery, and that is a small one, at best. It is conceivable that such a hemorrhage could have come from the mastoid cells through the aditus ad antrum, in view of the operative findings.

Hanau W. Loeb, in 1915, reported one case, and G. W. Boot, in 1917, reported two cases of acute hemorrhagic mastoiditis with marked bloody discharge. In their cases they found the mastoid cells filled with dark red blood clots with no pus or granulations. In smears Loeb found a gram negative diplococcus in short chains, the type described by Davis, while Boot found the streptococcus. The hemorrhagic cases are as a rule of virulent character with high leucocyte count and require early intervention.

It seems quite certain that the facial paralysis in my second case resulted from pressure upon the nerve within its bony canal by edema as result of the congestive hemorrhage. Surgical procedure was prompted by the thought that opening of the mastoid would relieve pressure and thereby prevent possible further damage to the facial nerve.

Case No. 3.—Mr. S. E., 32 years old, had a mild grippe for two days when he developed severe pains in his left ear. After two days of hot compresses the left drum ruptured spontaneously with a mucopurulent discharge and relief of pain and fever. The next day he noticed that the left side of his face was peculiar. He had no pain or twitchings in his face and felt good generally. Presented himself at the office on March 9, 1926, the fourth day of his ear trouble and second day of the paralysis. Examination revealed slight mucopurulent discharge in left canal, the drum slightly bulging, with a small perforation in its anterior inferior quadrant; temperature normal; slight tenderness at mastoid tip; reduced hearing for low tones; no vestibular disturbance and an almost complete left-sided facial paralysis. Taken to the Mt. Sinai Hospital and under gas anesthesia opening in the drum was enlarged. Discharge was more copious for one day. Under conservative treatment the ear condition cleared up in two weeks with normal hearing. X-ray of mastoid taken on the tenth day showed a cloudiness but no breaking down of cells. The facial paresis, however, persisted without any discernible improvement. After one month physiotherapy was instituted. It required three months for the paresis to entirely disappear.

COMMENT.

In this case we note the facial paralysis occurred on the third day of the ear disease, a rather early appearance. Nevertheless, although the ear condition per se made satisfactory progress to quick recovery the paralysis persisted for months. Whether the paresis would have continued longer without physiotherapy is problematical. It was earlier stated that a facial paralysis may exist for many months after recovery of the ear condition. My acquaintance with the literature on this subject encouraged me to consider the treatment of the facial paralysis in this case as that of the ear disease primarily, and the end result, although rather prolonged, justified this method. The paralysis apparently resulted from pressure on the facial nerve within its bony canal by a mild inflammatory exudate within or without its sheath.

SUMMARY.

1. Facial paralysis is an uncommon occurrence with acute otitis media.

2. Available statistics record less than 1 per cent of all otitic suppurations accompanied with facial paresis.

3. Most of the facial palsies are of peripheral origin.

4. Anatomicopathologic explanation of the facial nerve involvement assumes compressive factors as congestion, hemorrhage and mild inflammatory exudates within or without the nerve sheath.

5. Relatively few actual cases of facial paralysis with acute otitis media are recorded in the literature.

6. The prognosis in this type of case is very good, although recovery of the paralysis may be extremely slow.

7. The treatment of facial paralysis with acute otitis media is primarily that of the ear condition per se.

8. Physiotherapy (galvanism) should be applied in the prolonged facial paresis cases.

I wish to thank Dr. Noah Schoolman for his advice and assistance in the study and operations of cases 1 and 2.

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CVI.

OBSERVATIONS MADE ON FIVE HUNDRED AND SIXTY OPERATED MASTOIDS.

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For those who have been in practice for any considerable period, if they saw military service during the World War, the years 1917 and 1918 almost invariably mark that period into two very definite parts. War experience may not have changed the practice of medicine itself, but it undoubtedly worked great changes in the point of view of many medical practitioners, and if one seeks to find some good which resulted from so great an evil, postgraduate education of a large part of the American medical profession may surely be counted as such.

The 560 mastoid operations which I am about to consider have all been performed since the war, and some of the observations I have made upon them, and the comparisons with a not unlike series operated upon prior to 1917, are strikingly illustrative of the indirect effect of that conflict upon the practice of otology. The most potent single factor was undoubtedly the great influenza epidemic of 1918, with the return of the disease in a more attenuated form for several succeeding seasons. The otologic problem which this pandemic thrust upon every practitioner of medicine, no matter what branch he customarily considered his specialty, called attention to the vital necessity for prompt recognition and adequate treatment of even the seemingly most trivial of "ear complaints," and this awakening, which to a considerable degree the laity shared with the medical profession, is undoubtedly the reason for the lessened severity of the conditions which came for operation and the lower rate of mortality of the later series, as compared with the cases seen before the war. It was not that the patients were any more resistant or the infecting organisms any less virulent. Many individual cases presented all the complications and equaled in severity of infection any in the preceding series.

But in general they were seen earlier, and this factor, I am convinced, has counted for more than the more general dissemination of knowledge of how such cases should be handled —great as the advances in methods of treatment undoubtedly have been.

Early Myringotomy.—The very fact that the past ten years' experience has shown a growing appreciation on the part of the general public of the importance and gravity of ear diseases serves, however, to emphasize the dire need of much greater advances along these lines. Though the drumhead is undoubtedly incised by the family doctor much oftener than of old, it is not yet done soon enough or as often as it should be. More than all, the incision is very seldom adequate in size, and there is a very general failure to maintain drainage for a sufficiently long period.

Because of this inadequacy of so many incisions of the tympanic membrane done by general practitioners, I have made a conscientious effort to eliminate from my professional vocabulary the term paracentesis. The dictionary defines paracentesis as "the tapping of a body cavity." Paracentesis of the tympanic membrane, then, may properly be a mere puncture, a proceeding just about as useful in establishing proper drainage of the middle ear cavity as tickling the drumhead with a feather. It is not necessary to tell a gathering of otologists how to open an eardrum, but it is perhaps useful to emphasize how much it devolves upon the members of such a company to spread the gospel of early and adequate incision, designated by its proper name, myringotomy.

Too often incision of the eardrum is spoken of as "that little operation" done to relieve a pain the ear, as one would stop a cough with a licorice drop. The tympanic membrane is an exquisitely sensitive structure, and in nineteen cases out of twenty should be surgically intervened upon only when the patient is under full anesthesia. If circumstances make it essential to employ a local anesthetic the burden placed upon the operator will be that much the heavier. To perform myringotomy without any anesthetic whatsoever is, to me, an unthinkable barbarity. The incision must be made deliberately, preferably over the point of greatest bulging, as high up as possible.

The knife should be carried downward, then in a curve toward the side opposite from the initial incision, and finally upward, until the cut assumes a J-shape, leaving a generous flap at the bottom. This wide incision affords adequate drainage at the lower portion of the tympanum, just where it is needed. The flap tends to remain open longer than a straight cut, thus preventing the premature closing which the active recuperative powers of the tympanic membrane are all too likely to foster. The incision made, a vacuum cup is applied to the auditory meatus, and by negative pressure the contents of the tympanic cavity is sucked out. With the patient fully anesthetized the operator can use care and attain precision quite out of the question with a conscious and acutely suffering patient. As the majority of these patients are children the necessity of proper anesthesia is doubly apparent.

The "Classical Signs" of Mastoiditis.—If every "gathered ear" were properly handled, mastoid operators would have much more time to go fishing. Under present conditions, however, their piscatorial activities are still restricted. "Gathered ears" become "running ears" and eventually "mastoid cases." The family physician often recognizes the serious character the case is assuming, but he continues to use palliative treatment, feeling confident that the mastoid is not involved, because the "classical signs" are not in evidence. Most of the patients we lose may be truly said to have met death by reason of these same "classical signs." Time and again have I seen patients profoundly septic, moribund even, with the medical attendant still patiently awaiting the advent of the redness, swelling and tenderness over the mastoid, and the drooping of the superior posterior osseous wall, which for years our textbooks and teachers of otology have been parading as the classical signs of mastoid involvement.

There was a time—and it was not so long ago, either—when the surgeon who opened the abdomen upon an early suspicion of involvement of the appendix, was looked upon as "radical" in the extreme. When unmistakable evidence of the existence of peritonitis appeared he was justified in operating; then there could be no question as to whether or not there was trouble in the appendix. The patient seldom lived to justify his diagnostic acumen. Today appendectomy has become a commonplace; the

average man will "go and have it out" with little more fuss than is made over a visit to the dentist to have a tooth drawn. The doctor who waited until he was sure peritonitis existed would be likely to be read out of his medical society. It is to be hoped that the same attitude will shortly prevail in mastoid disease, so that "classical signs" may be hereafter omitted from diagnostic consideration. By the time they appear the patient is either doomed to immediate death or nature has succeeded in an unaided attempt to evacuate the pus, and by its extravasation through a cortical erosion has provided it with an external outlet, thus swinging the balance against intracranial involvement and a fatal outcome. Then it is easy enough to gain permission to operate, and the surgeon is censured or praised for an outcome over which he had very little control.

Roentgen Diagnosis.—If we cannot wait for the classical signs, it is evident that other diagnostic means must be sought by which early suspicion of mastoid involvement may be dissipated or justified. In going over the present series of cases I am invariably impressed with the great value of roentgenologic examination when properly made and intelligently interpreted. And perhaps I can find no more fitting place than this to acknowledge my great and continuous indebtedness to Dr. Willis F. Manges, roentgenologist to the Jefferson Hospital, where the majority of these cases were seen, for the invaluable aid he has given in the conduct of so many operations. Dr. Manges has been good enough to supply me with a succinct outline of his views on the value of X-ray in the study of mastoid disease, and the practical aid which can be afforded the surgeon by this means. Its chief value he postulates as follows:

1. To determine the anatomic type of mastoid—that is, the size of the cells and the size and distribution of the cell areas;

2. To determine whether these cells contain air or something else;

3. To determine the condition of the bone structure—whether or not there is atrophy, destruction or sclerosis present;

4. To determine the location of the lateral sinus with relation to the external auditory canal and to the external table of the skull—at times, also to show the size and relations of the emissary vein.

Normal mastoid cells containing air give the qualities of sharp detail and definite contrast in the roentgenographic shadows. Usually, especially in unilateral lesions, air in the mastoid cells can be readily recognized, because in most individuals the two mastoid processes are of the same anatomic type, and by comparison it can be determined that detail and contrast normal on one side show some slight variation on the opposite side.

The roentgenologist rarely gets an opportunity to see the very early stages of mastoid disease, and he probably views more chronic than acute cases. In the more advanced acute cases the cell walls will be decalcified, either by pressure of the exudate or actual invasion of bacteria, and under these circumstances the outlines of the individual cells are but faintly discernible. It is difficult to differentiate between purulent exudate and the granulation tissue which is likely to form after a more or less prolonged acute or subacute mastoid disease. If an acute lesion has actually destroyed the bone, there will be absence of detail, which may be interpreted as indicative of such destruction of cell walls or bone substance.

The stages of chronic mastoid disease, roentgenographically considered, are merely variations in the stage of sclerosis, with or without evidence of air bearing cell structure. When one is not able to recognize evidence of air bearing cell structure, the only conclusion must be that the mastoid is completely sclerosed, with no possibility of determining whether active disease is present. A normal mastoid, in which the cells are unusually small, may appear as if sclerotic, especially if there is exudate in the cells. This illustrates some of the difficulties faced by the roentgenologist in making interpretations.

One particular aid which the roentgenologist can offer to the surgeon is the preoperative detection of anatomic variations. In many of the cases here reviewed previous knowledge of a variation in the position of the lateral sinus has greatly lessened the time required to complete the operation—sometimes a vital factor—as well as increasing the patient's margin of safety. Often the findings of the roentgenologist permit accurate forecasting of practically the entire procedure, in a way which would otherwise be out of the question.

Bacteriologic Findings.—Much assistance can be afforded the mastoid surgeon by the bacteriologic laboratory. The accuracy of the findings, however, depends altogether upon the care with which the specimen is obtained, and as this is frequently done by the operator, success or failure lies largely in his own hands. Cultures should not be made from the exudate in the external canal, as this is practically certain to be contaminated by organisms which gain entrance from without. The specimen for examination should be obtained immediately after myringotomy is performed, before the exudate enters the canal. In those cases where the drumhead is already ruptured there will be considerable difficulty in obtaining an uncontaminated specimen, and for this reason it is frequently impossible to identify the causal organism in cases of long standing.

In obtaining material for bacteriologic examination during the mastoid operation, care should be taken to secure a specimen from some portion of the involved area which has not been reached by the irrigation of the external canal. The operator should bear in mind, also, the fact that instruments freshly sterilized in alcohol may carry in enough bactericidal fluid to render any culture sterile. All these circumstances render positive statements in regard to causative organisms more or less questionable, and for this reason I have been at no especial pains to collect data regarding the prevalence of different organisms in the cases here considered. Hemolytic streptococcus has appeared in more instances than any other single bacterium, but the list of those found at one time or another is a very long one, including practically everything likely to be encountered in a general hospital service.

Neglect of Early Otologic Symptoms.—Perhaps the most striking general impression obtained by reading over the history sheets in this series of mastoid cases is the length of time most of the patients have presented symptoms plainly indicating grave middle ear involvement, and in many instances the numerous endeavors to remedy these symptoms without making any rational endeavor to get at the basic cause. Occasionally an inefficient opening may have been made in the tympanic membrane many years before; more often there would have been spontaneous rupture with practically complete destruction of the membrane. Beyond the opening thus created

examination reveals extensive pathologic involvement of the middle ear cavity, which has been for years, perhaps, deluged with "drops" and irrigating fluids, which, if they had any effect whatever, merely served to accelerate the extension of the disease, which continually burrowed deeper into the mastoid process and the adjacent structures of the temporal bone.

Ineffective Operation.—The number of patients coming with a history of from one to five previous operations upon the mastoid is little short of amazing. This can lead us to but one conclusion: many of those now attempting to do mastoid work are not competent to judge of the extent or character of intervention needed in any particular case, or possessed of the technical skill essential for thorough performance of an operation of this type. For example:

A. S., male, 24 years old, native of Germany. On admission he walked the floor holding his head in his hands because of unbearable pain in both mastoid regions, which extended on the right over the parietal and frontal region. The condition dated back three years, at which time there was onset of pain and swelling over the right mastoid, but no discharge from the ear. After three months the mastoid was opened and temporary relief obtained. Within three years symptoms returned and the right mastoid was again opened; this was in February, 1924. In June of the same year it was opened a third time, because of great pain and discharge from the canal, after the operative wound had closed. Three weeks after this he came into our hands.

Operation: There were three separate scars, indicating the previous exploring expeditions into the interior. The soft tissues were very adherent. Through a very small opening in the cortex the space within the mastoid was seen to be filled with granulations and fibrous tissue. Practically none of the osseous wall had been removed, though the bone was very sclerotic and contained many deep cells completely diseased. The middle fossa was unusually high, but the antrum was shallow. However, the mastoid itself was deep and the cell area very extensive. The tympanum was filled with granulations and fibrous polyps. The reasons for the continuation of the terrific headaches were very obvious.

A deep and extensive exenteration was done without exposure of dura or lateral sinus. There was no evidence that any of the previous operators had gone anywhere near the antrum, or even attempted to clear away the most obviously diseased tissue.

M. C. S., female, aged 22. Right ear has discharged since childhood. Two previous "mastoid operations" had had no effect in lessening the discharge, the patient herself describing the ear as "sloppy." The concha was much inflamed and pus and granulations were evident within the canal. All landmarks were obliterated, and the meatus so contracted as to admit only a small sized speculum.

Operation: An incision between the two previous scars showed fibrous tissue firmly adherent to new bone formation. When this had been most carefully dissected away, a sinus exposure the size of the little finger nail came into view, a memento of one of the previous interventions. The sinus wall was covered with fibrous tissue, and the old mastoid cavity much narrowed, with the fibrous auditory canal adherent to it. Many of the original mastoid cells were still present, however, and antrum and tympanic cavity were filled with cholesteatoma, pus and fibrous tissue. The cells, which were very soft, extended back as far as the squamopetrosal articulation, and were filled with pus and granulations. The unusually high middle fossa was separated from the inner table by cells full of pus and granulations, while spongy necrotic bone was found over the labyrinth pyramid, extending almost to the apex of the petrous beneath the superior petrosal sinus. Diseased cells were also removed from the zygoma, the same soft necrosis extending to the apex of Trautmann's triangle. The originally diseased cells of the tip have been covered over by new bone formation.

The entire tip was removed and the hypotympanum practically cut away. The horizontal canal lay so deep that it was necessary to remove the posterior osseous canal to an unusually low level. Removal of the fibrous granulations, pus and cholesteatoma permitted a clean exposure of the promontory. Neither dura nor facial nerve were exposed, and the previous operative exposure of the sinus was well protected with

bone. This patient's convalescence was complicated by erysipelas, but she eventfully regained full health and excellent hearing in the right ear.

All too frequently a properly performed mastoidectomy or radical procedure will be ineffective because of postoperative neglect. In regard to after-care, the operating surgeon is frequently placed in a very awkward position. The question is complicated by professional ethics, by social equations and, most of all, by financial consideration of the patient. It is impossible for him to demand long continued attendance from those who perhaps live at a distance, nor to say frankly that that he considers the family doctor incapable of giving proper postoperative attention. Instructions to the home medical attendant are often hotly resented, and it is superfluous to stress the neglectful attitude of most of the laity when a patient is apparently "well" and very likely comes to resist being "fussed over." Children, especially, are all too frequently left without proper attention during the necessarily slow process of dermatization of a radical mastoid cavity, and if their natural powers of resistance are not high or have been greatly depleted by long illness and chronic intoxication, the chances for proper healing are greatly reduced. Sympathetic and helpful cooperation between otologist and general practitioner should be fostered by all parties concerned, and the attainment of such accord will promote better "end results" in all forms of ear work.

Occurrence of Cholesteatoma.—Concerning the 208 radical mastoid cases aside from the others, 64 per cent of the histories mention cholesteatoma as an operative finding. In the existence of cholesteatoma I am convinced that the radical operation is the only rational procedure. So much opprobrium has been cast on "radical mastoid surgery" that many operators feel a strong disinclination toward cleaning out the entire area if they can offer themselves any good reason for being less thorough. Again, there is certainly a fair percentage of men doing ear work who are actually afraid to undertake the radical procedure, or even perhaps totally ignorant of how to go about it, when confronted with a condition wherein nothing short of the most radical measures can deal adequately with the pathologic findings. The cases already cited are witnesses

of this, and not only are ineffective mastoidectomies performed, but auxiliary procedures—removal of tonsils and adenoid tissue, resection of nasal septum, turbinectomy, and so on—will have been done; all directed toward inducing the ear to "dry up," and all equally ineffective.

While I certainly do not advocate total disregard of any possibility of restoration of auditory function, I feel justified in saying that the patient's ability to hear with the ear operated upon is certainly no more jeopardized by performance of the radical operation than it is by the halfway measures so often employed in the hope of conserving the hearing. I have far more often been surprised by the evidence of how well the patient was able to hear despite the extent of the pathologic condition, than I have been by the extent of his loss of auditory power.

J. M. E., a banker, aged 43 years, presented himself with a history of scarlet fever in childhood complicated by otitis media with a discharge which had persisted ever since. He had received treatment most of his life, but had never been advised to undergo operation before coming to me. Recently the discharge had become less profuse; there was headache and dizziness; and hearing on that side was much diminished. Examination showed a foul-smelling dark-colored discharge from the right ear, with hearing on that side practically lost. The tympanum was filled with granulations.

Operation.—The mastoid was large and well developed, with a very adherent periosteum, which was removed with difficulty. The cortex was thick and eburnated, with large underlying cells, filled with cholesteatoma and a thin serous fluid, dark in color, and extending into the antrum. The tip—soft, necrotic and bleeding—had formed a sequestrum. There was a necrotic exposure of the dura as wide as the finger nail; the chorda tympani nerve was demonstrable; and the external semicircular canal plainly visible; the sinus, however, was not exposed. The tympanum was filled with cholesteatoma and the promontory covered by a large band of fibrous tissue. The radical procedure was done.

This operation was done on July 9, 1926. During March, 1928, I examined this patient and tested his hearing in the operated ear. He is now in excellent health, the cavity der-

matized and permanently dry, and the hearing vastly improved, so that it is not noticeably below normal. With such extensive destruction there could be little expectation that hearing would be retained.

The whole question of the occurrence of cholesteatoma, the conditions which produce it, and the measures which should be taken to get rid of it, is one which offers much material for thought and discussion. The fact that the majority of my patients were young, often hardly out of babyhood, yet showing the tympanum and antrum or the entire mastoid area packed with cholesteatoma, in my mind, points strongly toward some other origin for these collections than impaction of desquamated epithelium. The extensive destruction which these masses are capable of accomplishing by pressure necrosis is one of the most striking features of mastoid pathology, and is quite as likely to be seen in little children as in patients of mature years. In reviewing these cases I am continually inclined to believe that cholesteatoma has its origin in a definitely diseased condition of the underlying cellular structure. The accumulation of data certainly seems to give confirmation to this conception of its etiology.

Exposure of Dura and Lateral Sinus.—One very surprising feature of many mastoid procedures is the frequency with which we find necrotic exposure of dura and lateral sinus without any infection of these structures. Extradural abscess is by no means a frequent complication, appearing in less than 5/10 of 1 per cent of all cases, and sinus thrombosis is still less frequent, my records showing but three instances among the radical cases and one among the mastoidectomies. Considering that many of these patients were moribund when they were brought to us, some of them being seemingly snatched back from the grave toward which carelessness, ignorance and delay were hastening them, this circumstance seems all the more surprising.

Facial Paralysis.—It is noticeable that in this series of cases facial paralysis was a far less frequent complication than in those operated upon before the war. It has been my experience throughout that facial nerve disturbance is often due to inflammation within the nerve sheath, the fibers themselves remaining immune. Pressure from without may have a similar effect;

temporary facial paralysis following in either case. When the inflammation subsides or the cause of pressure is removed, either by nature or the surgeon, the nerve will gradually recover itself, and eventually return to normal function. In one case the facial nerve was exposed for a long distance, and it seemed impossible for it to escape unharmed, yet neither before nor after the operation did the silghtest disturbance of the facial muscles manifest itself. As a number in this series came to operation with facial paralysis well developed, it is evident that it may be coincident, yet in no way connected with operation. Yet when it appears it is the surgeon who must invariably bear the blame.

Meningitis.—In each division there were eight cases in which meningitis occurred, fourteen of them terminating fatally. The majority of these patients came into the hospital with the typical symptoms well developed, the mastoid operation being urged as the "one chance in a thousand." Any evidence of meningeal irritation is undoubtedly a very grave symptom, the most surprising thing about the mortality is that it is *not* one one hundred per cent. The conditions revealed at most of these operations demonstrated only too clearly how much delay and ignorance had contributed to the fatal outcome. This is perhaps best illustrated by a case which is *not* included in this series because no operation upon the mastoid was performed.

G. S., admitted to the Jefferson Hospital in the fall of 1927. Diagnosis of acute purulent otitis media and acute mastoiditis was confirmed by X-ray examination. Mastoidectomy advised but refused by patient, who shortly signed his release and left hospital. Readmitted October 21, 1927, suffering from otitic meningitis; temperature 102.5; w. b. c. 18,000; spinal fluid 800 cells per cm., slightly turbid under pressure and containing streptococcus. Death occured in 48 hours. Postmortem examination was denied.

In some cases, however, even the most prompt attention fails to avert the development of a fatal meningeal complication.

A. D., female, aged 7 years. Referred by her family physician to office; transferred to children's ward in Jefferson Hospital June 5, 1925. German measles had been followed by earache, to relieve which the family physician had done a bilateral myringotomy one week before. At the time of entrance

to the hospital there was edema over the left mastoid, abrasion on the auricle on that side, a profuse discharge from the canal, and infiltration of the adjacent submaxillary glands.

Operation.—Beneath the freely bleeding cortex the bone was soft; all the cells showed softening and degeneration, and were filled with pus. The mastoid was large and deep, with a very extensive cell area, everywhere extremely hemorrhagic. There was no exposure of dura, lateral sinus, nor facial nerve. Complete exenteration, irrigation, drainage and closure with clips.

A few days after the first intervention the right ear began to discharge, although the trouble on this side had apparently subsided after the myringotomy.

Second Mastoidectomy.—Blood oozed through the pores of the moderately thin cortex. The cells of mixed type were everywhere broken down into cavities filled with organized granulations. Free pus was found in the large deep mastoid area and in the antrum. It was possible to establish drainage by way of the mastoid, through tympanum and auditory canal. There was no dural, sinus or nerve exposure. Usual closure.

A large abscess in the groin was evacuated, discharging greenish-yellow pus, strongly suggesting a tubercular origin. Meningites developed within forty-eight hours, with rapidly fatal termination. Postmortem refused.

Fatal Cases.—Of the radically operated cases there were three deaths not complicated with meningitis; four among the mastoidectomies. Thus the percentage for radical operations was slightly above 5; for mastoidectomies 3½; and for the entire series of 560 cases, a little more than 4. Though this is considerably lower than the figures obtained before the war, a loss of more than 4 per cent of all operated patients is still far from encouraging, and this is the more so because I am firmly convinced that practically all of these deaths could have been prevented by early and decisive action. If we could set up the same standards in otologic surgery which now prevail in that of the abdomen, with a like prompt recognition and adequate treatment, our mortality figures would be cut in half. Cases such as the tubercular one just cited would undoubtedly turn up from time to time, but in general mastoiditis is a preventable disease, dependent upon ignorance, carelessness and delay.

Special Methods of Treatment.—I have already indicated my position in regard to operative technic and choice of methods; I may add, that though it often requires nice judgment to decide whether a mastoidectomy will take care of the conditions, or resort must be had to the radical procedure, I have never yet had occasion to regret doing a radical, whereas a number of mastoidectomies have had later to be converted into the more extensive procedure, proving my original judgment to have been at fault.

In this place, too, it may be well to say a word in regard to the bloodclot dressing. From the time of its introduction, the use of the bloodclot in the presence of suppurative mastoiditis has not appealed to me as a rational procedure. I have been at some pains to question pathologists and bacteriologists of high standing as to the possibility of its having any germicidal properties when so used, and every one has called my attention to the fact that on the contrary it offers an unrivaled medium for bacterial propagation. It has occurred to me that the patient thus treated may be enabled to produce antibodies in the particular portion of the circulation affected, so that the clot was thus rendered immune to infection. But if such is the case, it has certainly never been unquestionably demonstrated. Summing up, it seems to me that in those cases where the blood clot is "successful," that is, it does not become infected and break down, there is a very strong implication that the condition in the mastoid was not such as to demand operation at all.

Postoperative Radium Applications.—In badly infected cases where healing is slow, or occasionally fails entirely, I have found radium applications of the greatest service, and am becoming constantly a more ardent advocate of the use of this element in certain carefully selected cases.

M. D., married woman, aged 19. She had measles, scarlet fever and other children's diseases earlier in life. A "running ear" developed on the right in 1918, six years before marriage. Polyps were removed in 1919, but discharge continued until 1923 when she was treated by a chiropractor. After slight cessation the discharge resumed, being now of a very foul odor. A second removal of polyps in 1925 brought about no improvement, and when in December, 1926, pain set in over right mas-

toid, rapidly increasing in intensity, a radical mastoid was performed in a Los Angeles hospital. Thereafter there were frequent "shooting" pains over the right mastoid and the patient became subject to attacks in which she suddenly lost consciousness. These attacks lasted for perhaps five minutes and though at times she was able to rise without help, in most instances she had to be assisted to regain the upright position. A second radical mastoid operation was performed at Jefferson Hospital September 22, 1927. The single cavity left by the previous operation was filled with granulations, polyps and cholesteatoma. There was an extensive operative exposure of the lateral sinus, the wall of which was now attached to the soft outer structure by fibrous tissue; the previous operation had also caused two dural exposures in the mastoid roof, and attachments had formed to the skin surface by fibrous tissue. There was a deep erosion in the anterior petrous bar, directly above and involving the external semicircular canal. Below this canal, in the posterior osseous canal wall there was a deep groove, under the posterior facial ridge in the region of the oval and round windows, there was firm fibrous tissue. It seemed most remarkable that the old erosion had not extended into the facial ridge and involved the nerve. All diseased tissue was exenterated, the exposed sinus protected by iodoform gauze and the intervention completed in the usual manner.

In view of the operative findings it seemed desirable to offer some aid in the reparative process. Accordingly on November 18, 1927, 100 mg. of radium was applied in three different positions about the right ear, the total exposure being three hours. On January 21, 1928, a 12½ mg. needle was inserted in the ear for twenty minutes. Seen a few days ago, this young woman was in excellent condition, all the pain and indications of labyrinthine fistula gone, and the condition of the operated ear nearly normal. She works all day in a store without difficulty.

This case is typical of a number wherein marked benefit has followed the use of radium.

Postoperative Results.—As seems to be inevitable in any large series of cases, a good proportion of which are those of clinic patients, it has been possible to follow up but a small percentage of those who underwent operation long enough to feel satisfied as to the ultimate outcome of one's efforts. To

a questionnaire recently sent out I have been able to get responses from slightly more than 20 per cent. Yet to that one in five who wrote or came to my office (often from considerable distance) for personal examination, I wish to express my most profound gratitude. Without their aid, so cheerfully and promptly given, this review would have been wholly out of the question.

The query which is most often put to those who have the temerity to present a series of operated mastoid cases is: Is the ear *now* dry? And when we take into account the apparently unavoidable paucity of certified end results, this is undoubtedly a fair criterion by which to judge the merits of any particular procedure.

Certain confusing factors must, however, be considered. Repeatedly the patient and often his family physician will inform the surgeon that the ear has continued to discharge at intervals, indicating that complete dermatization has not taken place. Yet when we come to examine this patient ourselves we are likely to find that the cavity left by operation is packed with wax and desquamated epithelium, and when this is removed will find the cavity completely lined and dry, with no visible focus from which discharge might come. Nearly always diligent questioning will elicit the same story: The patient went swimming, or, more rarely, filled his ear with moisture in some other way. The impaction in the cavity was partially liquefied and found exit through the external canal. It is often hard to get an admission from the patient that water has entered the ear because he is always warned against just this contingency and is unwilling to confess that he has disobeyed orders. Yet most postoperative discharges have no more mysterious origin than this.

The lesson taught here is the wisdom—more than that, the vital necessity—of keeping these patients under continuous surveillance. The dentist does not bid his patient an eternal farewell after he has pulled his tooth nor does the ophthalmologist feel that he is seeing the last of his patient when he leaves the office with a lens prescription in his pocket. These patients keep in touch with the man who has treated them, as a matter of course; "looking after" their teeth and eyes is a perhaps unfortunate but nevertheless inevitable part of life's

routine. But the mastoid patient, whose pathologic condition is infinitely more serious than the vast majority of optical and dental cases, rarely comes under observation again unless alarming complications ensue, or the surgeon makes extraordinary efforts to follow him up. Yet if every otologist would make these efforts, in time the gospel might be so spread that our patients would come back of their own accord, and the knowledge that they would thus put at our disposal would yield a rich harvest of benefit to succeeding generations as well as their own. Can we not enter such a missionary crusade?

Five patients of these mastoidectomies who have reported still have a discharge, though the affirmative is generally qualified with "a little" or "sometimes." Sixteen subjects of radical operation have more or less discharge. No adequate deductions can be drawn from such a small number, unfortunately. All the patients whom I have examined in person have had dry and dermatized cavities, and, with perhaps three exceptions, every patient from whom I heard was in much better general health than before the operation was performed.

Hearing Ability.—My question in regard to the present state of hearing in the ear operated upon was so generally misunderstood that I can draw no worth while conclusions. As in most of the radical mastoids, the operation was more or less of a life saving measure, conservation of hearing being altogether a secondary consideration, or one wholly ignored when existence itself was threatened, the fact that a fair number reported their hearing to be distinctly improved in the ear operated upon is a matter of some congratulation. One boy, very deaf before operation, has been studying law and expects to be admitted to the bar in a few weeks; a teacher and a telephone operator carry on their occupations without any hindrance; some of the babies are now in school, equaling or excelling the mental attainments of children of like age who have never had any "ear trouble"; some young children previously considered mentally "dull" if not actually defective, are at present leaders in play and study. Had any one of these survived without the mastoid operation he would have been little more than a burden upon society.

Conclusion.—Any operator can learn much from a careful review of his previous work. His mistakes are quite as

illuminating as his triumphs, and he probably learns more from failure than from success. I have found this culling of my records of great educative value, and I trust that others may be able to gather from it something that will be of interest and help to them as well.

SUMMARY.

1. Experience gained by general practitioners during the World War has brought about more prompt diagnosis of ear conditions. A series of cases operated upon since 1919, when compared with one of earlier cases, shows earlier operation, fewer complications and lowered mortality. Still greater improvement is needed; prompt myringotomy in acute otitis media would reduce the number of mastoid operations later necessary; the so-called "classical signs" should never be awaited.

2. X-ray diagnosis is of value, but needs careful interpretation. Bacteriologic investigation should never be omitted, but care must be exercised to get an uncontaminated specimen from the tympanum after myringotomy or from the deeper part of the mastoid during intervention.

3. Many patients complaining of "running ears" and headache do not receive proper attention. Too often operative work is done on tonsils, nose, sinuses, etc., with the assurance that the ear condition will "clear up of itself." These facts and the large number of individuals coming for reoperation, sometimes with a history of from two to six previous interventions, lead to the conclusion that much ear work, especially so-called "mastoid surgery," is being attempted by those who are incompetent. Frequently the results of a properly performed operation are nullified by negligent after-care.

4. Cholesteatoma was present in a large proportion of the radically operated cases. As many of these were in young children, confirmation is offered of the author's theory that these masses are the product of a definite disease of the cellular structure. The dura and lateral sinus were exposed in many cases without any infection of these structures taking place. Extradural abscess and sinus thrombosis were seen much less frequently than in the series of ten years ago. Facial paralysis also occurred less often, and when it did appear was usually temporary. Meningitis complicated sixteen cases, fourteen of

which ended in death. The majority of these fatalities could be prevented by the means outlined for the reduction of the necessity for mastoid surgery.

5. The necessity for employing radical mastoid surgery arises frequently; the best judgment must be brought into play so that it may be properly employed. The blood clot dressing has not proved successful in the author's hands nor, on the whole, in the hands of others with whose work he is familiar. Postoperative radium applications are very valuable and bring about healing in otherwise entirely intractable cases.

6. Only 20 per cent of the patients in this series made response to a questionnaire concerning their present condition. Practically all of those who replied are in better health than before the operation. A large proportion of the ears operated upon are dry, and most of them hear as well if not better than before intervention.

CVII.

BRONCHOSCOPY IN A PATIENT FIFTEEN HOURS AFTER DELIVERY.

WILLIAM JEROME KNAUER, M. D.,

JACKSONVILLE, FLA.

The case history: Mrs. P. M. B., aged 21, entered Riverside Hospital June 5, 1928, at 3:20 p. m., as an obstetric case. June 6th, just after midnight, the patient received a short ether anesthesia during the third stage of labor, following the administration of which she vomited and aspirated a part of the stomach contents, which consisted mainly of particles of corn. This was followed by a marked respiratory embarrassment without much cyanosis except at first, a persistent cough, a temperature of 102, respirations 44, and a pulse of 120. Following the delivery I was called by Dr. Norris (the obstetrician) relative to the advisability of bronchoscopy. After reviewing the history and seeing the patient I advised a check-up physically by the internist (Dr. Cason) and a thorough X-ray study by Dr. Beals.

The X-ray report was as follows: "It is clear from all the films that the patient has a rather widespread pulmonary pathology, casting shadows of a character rather typical of bronchopneumonia, the amount of shadow increase very much predominating on the right side and particularly about the right lung root area. In view of the definite history of aspiration of foreign bodies, the condition could hardly be other than an aspiration pneumonia, particularly as the patient was free from respiratory symptoms before the occurrence of her accident.

The films made at inspiration and expiration were carefully measured but do not show the typical variations from normal which are usually found in patients with nonopaque foreign bodies. The most significant finding in these films being noted in the fact that the right side of the diaphragm descends during expiration, a phenomenon usually due to partial obstruction of the right bronchus.

Conclusions.—The X-ray appearances are rather typical of a bronchopneumonia, bilateral but predominating throughout the right side. In view of the definite history of aspiration of particles of food consisting largely of green corn, the pneumonia is very probably of aspiration type."

Dr. Cason's examination of the chest gave physical signs which confirmed the X-ray report.

At noon, June 6th, following Dr. Cason's and Dr. Beals' report, Dr. Norris, Dr. Beals, Dr. Cason and myself met for further consultation. As I could find no literature on the subject relative to bronchoscopy following pregnancy, I naturally could give no statistics that would reveal what the untoward effects would be. Postpartum hemorrhage, as well as what effect the bronchoscopy might have on the milk, were discussed. However, the final conclusion of all was that bronchoscopy should be performed and the family agreed. This was done under local at 4 p. m. (morphia gr. 1/6 and atropin gr. 1/150 were given one hour previous to bronchoscopy.)

The examination revealed many small, fine particles of food in the trachea and left bronchus, and the lower right bronchus plugged with a mass of soft food, the majority of which was removed by suction. Several of the larger particles of corn had to be removed with the forceps. The trachea was studded with numerous small petechial hemorrhages. A No. 7 Jackson bronchoscope was used. Time, eight minutes.

Following bronchoscopy the patient was greatly relieved of her dyspnea and felt at ease and comfortable. During the next five days there was an elevation of temperature once or twice daily, then a gradual decline until the eighth day, and then the temperature remained normal (see temperature chart). A cough and mucopurulent expectoration persisted, although gradually lessening each day until they entirely disappeared on the ninth day.

The after-treatment was as follows: Atropin gr. 1/150 for excessive mucous in chest; sodium bromide, gr. 30, for restlessness; electric pads to chest for tracheobronchitis; simple cough mixture for excessive cough; lowering of head and chest off of bed three times a day until all cough, expectoration and temperature had ceased.

The important thing to me is that the normal progress of the mother and baby was never interfered with. The milk continued plentiful and agreeable, and the baby gained normally. Although atropin was given every four hours during the first two days, and every six hours during the next three days, there was never any noticeable lessening of the milk. Soft diet was given the first five days, then regular diet after that.

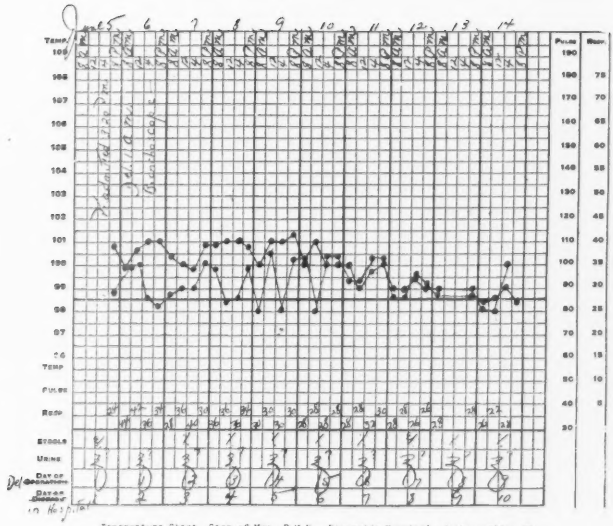
Daily X-ray studies while in the hospital showed marked improvement on each successive day. The patient was discharged on the thirteenth day.

Dr. Cason's report of chest on day of dismissal from the hospital showed physical signs negative, lungs entirely clear.

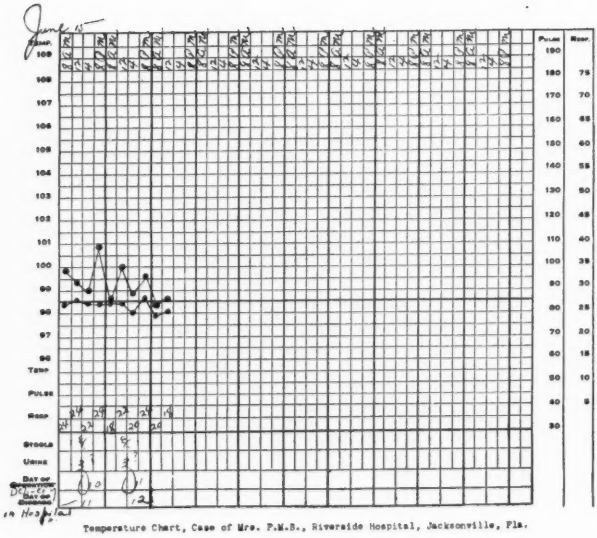
An X-ray, made July 2nd (about four weeks after bronchoscopy), showed negative lung findings.

SUMMARY.

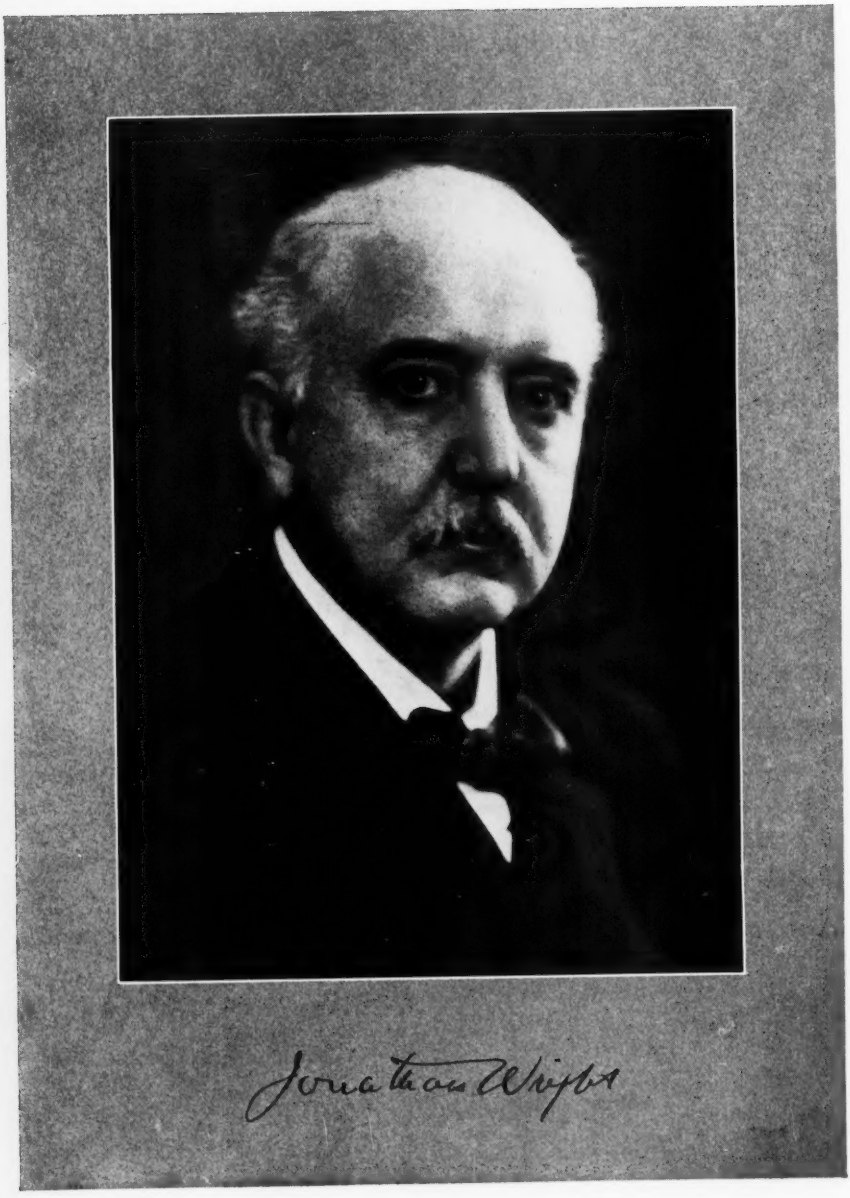
1. Bronchoscopy was performed postpartum, with no untoward effects to the patient.
2. That the feeding was not interfered with.
3. That the progress of the baby was normal.
4. That recovery following an aspiration pneumonia with bronchoscopy was uneventful.
5. That I would do a bronchoscopy earlier on the next case under similar conditions.
6. That a consultation of the internist, the obstetrician and roentgenologist and their constant advice is a necessity in the competent handling of such a case.



Temperature Chart, Case of Mrs. P.M.H., Riverside Hospital, Jacksonville, Fla



Temperature Chart, Case of Mrs. F.M.B., Riverside Hospital, Jacksonville, Fla.



UNIV. OF ILL.

CVIII.

JONATHAN WRIGHT, M. D.,

1860—1928.

PLEASANTVILLE, N. Y.

The passing of Jonathan Wright marks the close of one of the most brilliant excursions into the *belles lettres* and the philosophy of medicine.

In anyone not familiar with this genial, scholarly, sometimes crotchety but ever grand old man, the mere titles of his works must arouse astonishment. Here one finds a wide diversity of studies in pathology—atrophic rhinitis, lymphoid cysts, tuberculosis; now the Mutation Theory of Evolution, the problems of heredity, Galen, Empedocles; and again a caustic morsel, "Some Critical and Desultory Remarks . . . ." on the laryngological literature of the day.

To one who knew him, his personality overshadowed even his works. His writings were himself. His conversation overflowed with the things which interested him—and everything interested him. The primordial forces which govern life and death and generation were intensely vital to him even latterly, in the retirement of the country, whither he repaired in 1915, to devote himself to his grandchildren and the Ancients.

Jonathan Wright was born on February 2, 1860, in Springboro, Ohio, and was the son of a physician. He was educated there at Miami Valley College, "an experiment in Quaker education which had been established by his father, and which in plan foreshadowed the present Antioch College."

After a year spent in the study of languages with Dr. Saveur of New York, he entered the College of Physicians and Surgeons, and was graduated in 1883. For several years after his marriage to Miss Susan Choate, daughter of Dr. G. C. S. Choate, he practiced in Brooklyn and New York and was connected there at various times with the Roosevelt Hospital, the De Milt Dispensary, the Manhattan and the Brooklyn Eye and Ear hospitals, the New York Infirmary for Women

and Children, St. Mary's Hospital and Kings County Hospital. In 1910 he became Director of Laboratories at the Post Graduate Hospital.

Dr. Wright is the author of two books, one a History of Laryngology and Rhinology, published in 1902; the other a textbook of Diseases of the Nose and Throat with Dr. Harmon Smith, in 1914. A monumental work on the Medicine of Primitive Man has appeared serially in the pages of *Medical Life*.

His diversity of scholarly pursuits inducted him into the ranks of many scientific societies* beside the prominent American otolaryngological bodies.

The last twelve years of his life were devoted chiefly to writing. In 1917 Sluder, then preparing his first text on Headaches of Nasal Origin, besought him to undertake the investigation of the sinus pathology underlying some of these disorders. Wright refused flatly, giving as his reason his recent retirement from active pursuits. Sluder, to whose patience and persistence "no" and "yes" were often synonymous, finally induced him to prepare a chapter on the subject; and a warm friendship developed between the two men which persisted throughout the remainder of their lives.

Jonathan Wright's mind was a combination of unquenchable curiosity and profound erudition. A visit to his country home, "Windy Rock," near Pleasantville, N. Y., was in the nature of a pilgrimage to me. I found him in this beautiful, secluded spot, serenely happy with his family, and his beloved books—row upon row of Plato and Galen, Hippocrates, Aristotle and the rest—one felt that sometimes they all sat with him around his table and enjoyed a congenial chat.

I have walked with him under the trees and reveled in his sparkling conversation. His mind was at peace but never at rest, and his effervescent observations on the life about him

*"American Men of Science" recites the following list: Am. Med. Assn.; Assn. Path. and Bact.; Am. Laryngol. Assn.; Anthropol. Assn.; Archeol. Inst.; Am. Geog. Soc.; Genetic Assn.; Hist. Sci. Soc.; N. Y. Pathol. Soc.; fel. N. Y. Acad.; N. Y. Acad. of Med.; Cor. Memb. of Royal Soc. of Med.; British Classical Assn.; Brit. Soc. Prom. Hellenic Studies; Gesellschaft für Geschichte der Medizin; Soc. d'Hist. de Médicine de France.

were full of the joy of his own living. (The last few lines from his pen bore the title, "What sort of thing is life?"!). One moment he talked of the beauty of the forests surrounding his home and of the deer which came to his spring to drink; the next he was up to his bushy eyebrows in the mysteries of spontaneous generation or the surface tension of protoplasm. After a day with him, I would come away, my head swimming with the problems of our very existence.

At the time of his last contribution to this journal, in March of the present year, his strength was beginning to forsake his undaunted spirit, which irked him unspeakably. From the Neurological Hospital in New York, three days before his death, he wrote me,—a halting and painfully scriven letter, almost illegible. But I know his eyes twinkled as he signed, with a last characteristic gesture, "Yours in a bad way, Jonathan Wright."

ARTHUR W. PROETZ, M. D.

St. Louis.

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U. OF MICH.

CIX.

LEON E. WHITE, M. D.

1867—1928.

BOSTON.

Dr. Leon E. White, a specialist in diseases of the ear, nose and throat, having an office at 390 Commonwealth avenue, Boston, died of coronary sclerosis, at his home at 112 Wolcott road, Friday, May 18, 1928.

He was born in Barton, Vt., July 30, 1867, the son of Orra A. and Emily B. (King) White. He graduated from Barton Academy in the first class ever graduated. He graduated from St. Johnsbury Academy in 1886 and from Dartmouth College in 1890, and followed that with a medical course in the same college. He took many prizes and honors throughout his educational course, winning the highest standing any man had taken in Dartmouth Medical School in ten years. After a few years as a general practitioner he became house surgeon at the Massachusetts Charitable Eye and Ear Infirmary and continued as surgeon until within two years of his death. For several years he was surgeon in otology at St. Elizabeth's Hospital. He was a member of the American Medical Association, American Otological Society, American Laryngological Society, American Academy of Ophthalmology and Otolaryngology, American Laryngological, Rhinological and Otological Society, and Fellow in Otology, Harvard postgraduate school. He made numerous contributions to the literature of his specialty and was known the world over for his researches in connection with optic neuritis. About two weeks before he died he went to Washington, D. C., to present a paper to a gathering of specialists.

He was a man of magnetic personality and of sterling worth, drawing around him a large circle of friends who appreciated his noble and manly qualities.

While a hard worker and entirely devoted to his profession, he found time for the enjoyment of all that was beautiful in nature. Born among the Vermont hills, he always had a very

keen love for birds, flowers, the great mountains and the open spaces. He made four trips in his automoblie across the country to visit the most celebrated features of American scenery. He loved the simple life and was devoted to his home. Two years ago he built a new home on Chestnut Hill, Brookline, and he was in the act of beautifying the grounds with flowers when the end came.

He is survived by his widow, a son and a daughter, both physicians in Boston, Dr. Leon E. White, Jr., and Dr. Priscilla White; by his father, Orra A. White of Barton, a sister, Mrs. Junius E. Mead of Johnstown, N. Y., and a brother, Arthur O. White of Orleans.

FRANCIS P. EMERSON, M. D.

THE PUBLICATIONS OF LEON E. WHITE

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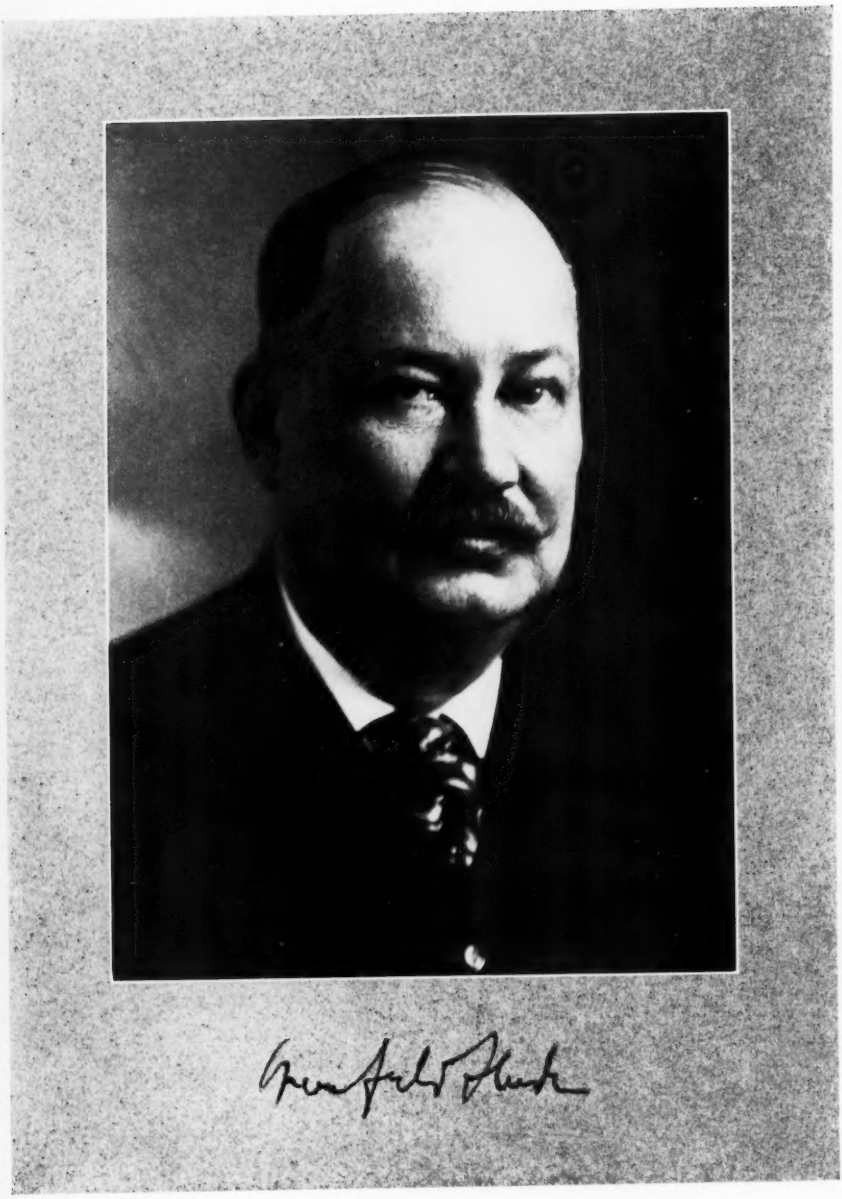

UNIV. OF MICH.

CX.

GREENFIELD SLUDER, M. D.*

1865—1928.

ST. LOUIS.

Dr. Greenfield Sluder, St. Louis, a graduate of Washington University School of Medicine, St. Louis, 1888, died October 9, 1928, at Barnes Hospital, St. Louis, of pneumonia, following amputation of the right leg due to infection, aged 63.

Dr. Sluder was endowed with a mind which brought to him an eventful career. He often insisted that he was hardly thought worth educating in his youth because he did not take readily to the conventional studies as he grew up. He esteemed it fortunate that he was sent to the Manual Training School of Washington University. It was during the developmental period of the school when Professor Woodward was personally watching the psychological effects of combined training—"The cultured mind, the skillful hand"—this was the motto of the school.

When a cultured mind directs a skillful hand to the relief of pain it may perhaps be said that the highest art has been reached.

Instead of the formal single year in the St. Louis City Hospital, the training school which has produced so many of our best general and special surgeons, Dr. Sluder had four. He could easily have practiced as a general surgeon when he left the hospital, but he elected instead to spend six years in general medicine with Dr. W. E. Fischel, then in the busiest period of his distinguished career. So, when he went to Europe for special training in rhinology and laryngology he was already a fully developed physician and surgeon with a record of successful accomplishment. He was already a successful teacher, a function he prized to the end of his days because it multiplied his usefulness to his fellows and to his community.

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*Reprinted from the Journal of the Missouri State Medical Association, November, 1928.

His foreign training was exacting and laborious. Original work on the physiology and minute anatomy of the larynx brought to him the high regard of his instructors. He said he did not see a patient for ten months. His early work was all in the laboratory.

When he returned to St. Louis to enter his specialty he had in his mind not the mere acquisition of patients and the development of a lucrative practice. These came to him as a matter of course. He knew he had capacity to solve some of the most intricate problems in rhinology and laryngology, and he diligently pursued such anatomical and physiological studies as he knew would best equip him for the work. He always had a problem in process of solution, for he never rested; even when on "vacation" at Harbor Point, he carried his books and manuscripts often in the quiet of his den, getting the opportunity to do thinking which his busy life at home forbade.

So the substantial advance he brought to us in knowledge of the tonsils, the neurology of the paranasal sinuses, the hyperplastic bone changes, the swallowing reflex and the extended influence of the nasal ganglion were the product of a cultured mind disciplined to laborious and continuous effort.

Sluder's neuralgia is now well known as is also the change at times brought about in the optic discs by sinus disease.

He was acute in physics and the vacuum headache he worked out with Dr. Ewing.

His manual training led him to devise special tools (instruments) to carry out specific procedures. The Sluder tonsillotome is based on a keen anatomical observation coupled with a trained mechanical sense. He early recognized the principles of the light reflex in searching the nose and throat for obscure lesions, so he practically reproduced sunlight at each of his work tables by means of a specially devised lamp.

Only those who worked with him (and some patients) realized the enduring patience with which he pursued his search for lesions. It was not unusual for him to keep a patient all day, making and recording observations twenty or more times. He was equally relentless with himself in his pursuit of truth and did his work so painstakingly that the courage of his convictions rested on a very solid foundation and never gave way when bombarded by criticism.

Latterly his restless zeal impelled him to a study of the sympathetic nervous system, about which little is known. His most vivid expressions of impatience over the illness which began in Boston two or more years ago were brought out because he could not pursue these studies he had mapped out and which he felt competently trained to follow. He was unperturbed when the Fellows of the Association could not at the time accept his opinions, for he never presented a hastily prepared paper just for the sake of appearing on the program, and he scorned those who did. When he read or published a paper it was based on an adequate number of carefully checked observations and was ready to be added to the textbooks of his subject.

Such was Dr. Sluder in the field of science, an honest and diligent observer who kept his mental feet solidly on the ground of general medicine and whose broad general training, special training and common sense made him a leader amongst men of foremost talent.

Such men are rare. We shall not soon see his like again, and though he has left us a glorious heritage we regret he was not spared to enjoy the tributes he so fairly earned, growing with the years.

Dr. Sluder was indefatigable in the pursuit of knowledge concerning his work. He was a frequent contributor to periodical literature, some fifty titles being listed in English and German journals. In addition to this he was the author of three monographs: "Concerning Some Headaches and Eye Disorders of Nasal Origin," 1918; "Tonsillectomy by Means of the Mandible and a Guillotine, With a Review of Collateral Issues," 1923; "Nasal Neurology, Headaches and Eye Disorders," 1927.

MALCOLM A. BLISS, M. D.

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Abstracts of Current Articles

ABSTRACTS OF REPORTS MADE (BY INVITATION) TO THE FIRST INTERNATIONAL OTO-RHINO-LARYNGOLOGICAL CONGRESS, COPENHAGEN, JULY 30 TO AUGUST 1, 1928.*

Septic General Diseases of Pharyngeal Origin. (Die vom Schlunde ausgehenden septischen Allgemeinerkrankungen.)
Prof. W. Uffenorde (Marburg).

Recognizing the dearth of accurately studied microscopic material, Uffenorde inclines, without acknowledgment, to long-accepted American opinion of the importance of late tonsillar sepsis. His review is based almost entirely upon German and Austrian sources.

Palliative treatment or incomplete removal of severely infected tonsils is discouraged. Phlegmons from tonsillar remnants may be as severe as Ludwig's angina. These phlegmons, largely streptococcic, are especially severe as complications of influenza, when their fibrinous exudates may simulate diphtheria. Familial susceptibility to these processes is common. Peritonsillar inflammation may come from neighboring dental sepsis. Such abscesses may burrow into the deep fascia of the neck or into the retropharyngeal region and mediastinum or laterally toward the parotid. Adenoid abscess and phlegmon, and follicular lingual tonsillitis with abscess formation, are rare but dangerous possibilities.

Uffenorde maintains that not every purulent accumulation is a source of general sepsis; that a lowered resistance or anatomic breaking through must precede blood stream or gross lymphatic involvement. He has collected 87 sepsis cases in men and 50 in women; of these, 20 were from 10 to 20 years of age, 54 from 20 to 30, and 23 from 30 to 40. Streptococci, especially S. putridus, played an important rôle; no report of

*From the presessional volume; verbal abstracts covering twenty minutes' delivery were made by all who presented reports, except Professors Wittmaack, Holmgren and Mouret.

hemolysis is made, but numerous anaerobes were found. S. viridans was discovered in certain cases with heart complications and articular rheumatism. Several staphylococcic cases are mentioned. Infection, whether exogenous or autogenous, depends upon lowered resistance plus increased bacterial virulence. High white count, loss of red cells, and irritation of the kidneys are predisposing factors to general infection, present in every case of acute tonsillitis. Uffenorde rejects Fränkel's theory of invasion of the tonsillar venous plexus, with direct thrombophlebitic extension to the jugular blood stream. Such invasion may occur in subacute cases which have been hanging on some weeks. He is convinced that such involvement is originally periphlebitic. This type of septic extension along the lymph channels of these veins shows no penetration of the vessels themselves, in numerous postmortems of fulminating cases. Invasion of venous structures may take place later, at some distance from the point of original extension; but even here the invasion comes through broken down perivenous structures infected through lymphatic channels. The longer these defensive mechanisms hold out, the more unexpected and widespread will be the types of complication; glands may be involved in the most distant regions of the neck, even on the opposite side. Extension upward is reported, via the pterygoid muscles, with cavernous sinus thrombosis or meningitis. The mediastinum may be reached before venous invasion occurs. Entrance of infection is not limited to tonsillar tissue, but may come from lesions of the mucosa alone.

Little difficulty attends the diagnosis of acute cases; but after the tonsils have again quieted down retropharyngeal changes, bone changes, possible foreign bodies, distant edema and emphysema must be sought in explanation of the septic temperature, chills, leucocytosis, bacteremia, swollen spleen, etc. Changes in the blood picture must be carefully watched, especially as acute anemias may, owing to low resistance, permit bacterial invasion of the mouth and pharynx. This is especially true of agranulocytic angina and of angina with increase of mononuclear lymphocytes.

Treatment must be surgical: exposure of the septic foci followed by tonsillectomy. Guided by the sheath of the cervical vessels, digital exploration may be made from the digastric

and lateral pharyngeal regions down to the peritonsillar region. Venous ligation he considers unnecessary and even harmful. Mediastinal invasion is rare and does not often require the deep incision advised by Glogau and others. Tonsillectomy must be postponed if great weakness, somnolence or trismus are present, and must be hastened with signs of renal damage.

Speaking obviously of conditions in Germany and Austria, he avers that complete tonsillectomy must take place whenever the tonsils are guilty of causing general disorders. He minimizes the danger of such operation to the patient, attempting to reassure internists as to improvement in technic, lack of danger from bleeding and from lung abscess. Careless reading has convinced him of a "frightful number of lung abscesses" in American clinics; these he correctly ascribes to excessive narcosis with abolition of the cough reflex. It is regrettable that so able an investigator as Uffenorde should manifest before the congress such colossal ignorance of the entire American literature of his subject. Certainly much of his work was discussed a dozen years ago by American bacteriologists and immunologists as well as by our laryngologists. F.

Septicemia of Pharyngeal Origin. (Setticemie di origine faringea.) *Prof. Gherardo Ferreri (Rome).*

Recognizing that tonsillectomy and adenectomy are too often proposed for merely commercial reasons, Prof. Ferreri nevertheless feels that the continued presence of chronic infection in these structures justifies their complete removal. His citations regarding development, surgical anatomy and physiology of the tonsil are largely American, and he shares our general notion of their protective function in early childhood, while inclining to the opinions of Coolidge, Shurly and Swain as to the undesirability of removal in every case. Mere size is no indication of danger from retained sepsis, nor are ill-smelling tonsillar plugs an index of the presence of dangerous bacteria. Prof. Ferreri recognizes the pharynx as the portal of entry for the recognized germs of diphtheria, pneumonia, cerebrospinal meningitis, influenza, etc.; for the unidentified toxic agents of the exanthemata, mumps, whooping cough, acute articular rheumatism, etc.; for septicopyemic lesions (mainly from the tonsil) giving rise to general complications; and for diseases like scarlatina and Vincent's angina, which associate with pyogenic organ-

isms to cause serious general infective phenomena. The relief of goiter, nephritis, rheumatism and endocarditis, and appendicitis, through tonsillectomy, is maintained by abundant quotations and from personal experience.

Ferreri, like Uffenorde, regards streptococci as the most frequent causative agents in the (fortunately rare) cases of general sepsis from throat lesions, and includes the streptococcic rash among other diagnostic points. Other dangerous types cited include the pneumococcus, meningococcus, typhoid and paratyphoid, proteus, B. septicus capsulatus, and Friedländer's B. pneumoniæ. Ferreri does not take sides with Fränkel in favor of immediate thrombophlebitis of the tonsillar vein, as against Uffenorde and Ruttin, who make thrombotic changes secondary to lymphatic extension. Blood examination of cases showing severe temperature rise and chilling will disclose total lack of eosinophiles, high initial polymorphonuclear leucocytosis with a gradual shifting of the nuclear picture "toward the left" that indicates interference with the hematopoietic function of the bone marrow. Blood culture, if positive, occasionally produces the hemolytic streptococci, but almost always some anaerobic, Gram-negative organism. Metastatic lung abscess may be suspected when deep nonproductive cough begins; joint metastases occur in the knee, elbow, metacarpal and tibiotarsal joints. These complications go on to pus formation, contrasting with the relatively mild course of S. viridans arthritis, which shows more symptoms from the heart valves and kidneys.

Ferreri warns against the serious consequences of pyemia from a neglected or unidentified Vincent's angina.

He relies on American authorities in discussion of methods of removal of the tonsil, pointing out the compensatory hypertrophy of other lymphoid tissue which may become a gateway for infection. He directs attention to the possibility of starting septic extension by faulty injection of local anesthetic, and quotes Loeb's opinion that tonsillectomy should be considered a major operation.

It is unfortunate that Prof. Ferreri's admirable review was (apparently by governmental command) written and delivered in Italian, which was not an official language of the congress.

It was accordingly understood by very few beside his own delegation. From the bibliography, however, the German delegates were perhaps able to note that of seventy-one papers cited, Prof. Ferreri cited thirty-four American authorities in forty-five separate contributions. F.

The Conservative Radical Operation for Chronic Otitis Media. (Die conservative Radikaloperation der chronischen Mittelohrenentzündungen).
Prof. H. Neumann (Vienna).

Loss of hearing, persistent retroauricular opening, and excessive size and delayed healing of the radical cavity are disadvantages which have, in Neumann's opinion, led many operators to modify the radical technic by leaving the membrana and ossicles in place and avoiding interference with the eustachian tube mouth. Between 1893 and 1912 numerous "conservatively" operated chronic cases were reported; retention of hearing encouraged most of the operators, but a good many cases required subsequent reopening or ossiculectomy. Between 1919 and 1915 the conservative type of operation was recommended as such by clinicians in several countries. Bárány's method without plastic, in an attempt to close the aditus, dates from 1921. Neumann considers primary suture over bloodclot by Bárány's later method to be dangerous, because firm scarring does not occur. Cystic spaces prone to infection are found in such operative fields, and may require splitting of the meatal wall for drainage. Where the dura or semicircular canal is closely approached or eroded, special danger is to be feared from primary closure, especially if the procedure be undertaken during an active exacerbation. Neumann does not consider Heath's and other methods whereby part of the posterior bony wall is preserved, to be "radical," but rather extensive "simple" operations. Mucosal suppuration, without cholesteatoma or polyp formation, may yield readily to such extensive "simple" procedure. Where, however, severe destructive processes, extensive cholesteatoma or granulation tissue or further complications exist, preservation of hearing must yield to the need for saving life.

Beyer's recent method of enlarging the aditus, with complete removal of all diseased bone, receives Neumann's approval.

Cases must be carefully selected. In the presence of cholesteatoma, attic perforations should be carefully cleared away from neighboring meatal skin to avoid recurrences. Cases with high perforation and clear *pars tensa* are better suited to the conservative operation with retention of hearing; and the tube should be left alone, while treatment of etiologic factors in the nose and pharynx is imperative. Even remnants of hearing are worth preserving because of their helpful influence on the unaffected ear.

The ossicles are affected, especially at the incudostapedial articulation, in 80 per cent of chronic middle ear suppuration. If the incus is lost, the malleus may best be removed in the interest of visibility and drainage. Reduction of hearing from scarring after ossiculectomy is debatable.

Easier and shorter after-treatment, claimed for the conservative operation, is problematical because of differences in the infective agent and in care of the case previously. Continued discharge necessitating indefinite treatment is found as often after the conservative as the radical operation. The ideal of protection to life, with a large epidermatized cavity free from secretion, is only attained by the radical operation. Recurrence after the conservative operation can readily lead to dermatitis, then to bone involvement entailing reoperation. Poorly nourished epithelium lying upon scar and granulation tissue is badly equipped to resist invasion by pathogenic organisms, either outward from the bone itself or inward from the cavity. Exfoliative ulcerations keep up the moist and unhealthy condition. Such maceration, if neglected, leads readily to granulation and to secondary osteitis. Nowhere else over the bones of the body can epithelium be made to grow down over a scarred mass of connective tissue.

Neumann demonstrates histologically in three cases, six to twenty-three years postoperative, that in spite of complete epidermatization of the radical cavity, erosion, osteoporosis and filling of the marrow spaces with soft fibrous tissue often take place. Subepithelial cysts invisible to otoscopy may occupy the round or oval window, explaining recurrence or complication. Microscopic cholesteatomata may be overlooked and develop under cover.

These findings—similar to those of unoperated chronic suppuration—show that even after the most extensive radical operation danger still persists if the cavity is not watched.

Interference with hearing after the radical operation depends on the amount of scarring, desquamation from the plastic flap, poor nutrition of epithelium directly over bone, etc. Neumann therefore spares operative trauma to the middle ear as much as possible. Sound healing of such a cavity scraped clean of its mucosal investment is rarely demonstrable. Progressive deafness, not from scars but from these bony changes, may thus intervene. One case is reported in which the horizontal semicircular canal became irritated by such late bony changes. All of these cases had macroscopically clean, apparently healed radical cavities. Neumann does not consider the exact type of operation or flap so important as is the avoidance of dragging the canal wall too widely from the bone by use of a gauze strip for retraction. Instead, he prefers to excise the upper internal segment of the skin of the canal, thus gaining a good view of the middle ear and getting rid of von Troltsch's area, from which cholesteatomatous invasion is thought to start. He is careful to throw his plastic flap toward the region of broadest and most dangerous exposure. Aside from these technical objections, the patient's dissatisfaction with a cavity which requires regular attention is additional ground for favoring the conservative operation.

Until histologic investigation of conservative radical cases can be made after a long period has elapsed, Neumann feels that the complete radical is to be preferred for reasons of prophylaxis. Complete healing occurs in practically equal proportions. Preservation of hearing is somewhat more likely with the conservative operation. In complicated cases, especially when the cranium is invaded, the radical procedure should be complete. Operations begun as conservative should be completed radically if such complications are discovered.

Conservative operation is indicated where intratympanic treatment has helped but not dried up the process. He prefers local anesthesia for conservative cases, and maintains that his conservatism consists in all possible avoidance of instrumenta-

tion within the tympanic cavity and the tube mouth, while carefully exposing the attic and the hypotympanum. Thus he retains hearing of synergistic value to the good ear. F.

Influence of Anatomic Structure on Suppurations of the Middle Ear. (La structure anatomique de l'oreille moyenne et son influence sur le cours des suppurations de l'oreille.)
Prof. J. Mouret (Montpellier) and Prof. G. Portmann (Bordeaux).

After an exhaustive description of the anatomy, embryology, cellular systems and avenues of infection of the entire temporal bone, the late Prof. Mouret and his brilliant collaborator discuss Wittmaack's theories of arrested pneumatization.

Sclerotic mastoids, as frequently discovered in operation for chronic suppuration and cholesteatoma, are, in Mouret and Portmann's opinion, the principal cause rather than the result of suppurative processes. Wittmaack maintains that persistent irritation of subepithelial connective tissue of the tubotympanic lining is responsible for stopping epithelial proliferation toward new and preformed spaces: hence, arrest of pneumatization (usually sterile), provoked by amniotic fluid, food particles, etc. Mouret and Portmann consider that personal predispositions which they cannot explain are to blame for failure of certain mastoids to pneumatize. They reject racial tendencies, stoppage of the eustachian tubes by adenoids, otorrheic diathesis, as well as Wittmaack's irritant theory.

If 90 per cent of the newborn are thus irritated, they inquire, why are not sclerosed mastoids more frequent? Also, why are so many individuals suffering since babyhood from chronic suppuration found to have pneumatic mastoids? They agree with Wittmaack that no truly sclerotic mastoids exist; merely compact, or spongy bones, without cellular structures.

The mastoid, in their opinion, is homologous with other pneumatic bones (frontal, ethmoid, maxillary), wherein suppuration does not cause disappearance of the cavities through bony sclerosis. Not only does tympanoantral suppuration not provoke sclerosis; it is, on the contrary, absence of cells which favors transition to the chronic state, where the affected mucosa of these almost closed recesses tends to epidermize or to form a cholesteatoma. F.

Influence of Anatomy of the Middle Ear on the Course of Otitis Media. (Der Einfluss der Anatomie des Mittelohres auf den Verlauf der Mittelohrenentzündungen.)
Prof. K. Wittmaack (Hamburg).

Wittmaack calls attention to Mouret's reliance upon gross anatomy, while his own opinions are based upon serial microscopic sections of many hundreds of temporal bones. A certain small percentage of normal ears are found to have sclerotic mastoids. Accurate microscopic investigation of these functionally normal ears shows them to have unusually flat and thin epithelium with thin, vascular connective tissue beneath. This covering grows thicker in the depressions, and thinner over prominences, while thickest of all about the tube mouth and in regions where pneumatization has occurred. Two types of mucosa are thus found present in such ears: hyperplastic, with a thick, vascular, myxomatous subepithelial connective tissue layer, and heavy epithelium varying from cuboid to ciliated cylindrical. The hypoplastic, fibroatrophic type has a much thinner and less vascular subepithelial layer.

He outlines the course of normal epithelization of the developing pneumatic mastoid, contrasting it strongly with that of the sclerosed mastoid. The latter is, he insists, preceded by latent otitis of the newborn, with filling up of the cavities by hyperplastic mucosa, exudation without perforation of the tympanic membrane, organization of connective tissue in consequence of retained exudate and closing off of cavities into cystic spaces. He blames the persistence of myxomatous tissue, later changed into hyperplastic mucosa, for the change of pneumatic cells into a compact bony mass. He inclines to the view of congenital predisposition to each of the three types of mucosal development. Nevertheless he maintains that an external irritant is needed during the first year of life to initiate his "latent otitis."

He recognizes the following types:

1. Extensive regular pneumatization, with thin, regular, normal mucosal development.

2. Sclerotic mastoid, with markedly hyperplastic mucosa.

3. Sclerotic mastoid, with markedly hypoplastic fibrous mucosa. Every degree and variation, owing to differences in the original processes, may be found. Even in clinically and func-

tionally healthy ears very great variation in mucosal structure occurs. Wittmaack distinguishes a number of mucosal forms which in his reiterated opinion are closely allied with changes in pneumatization:

1. Mesoplastic (normal) mucosa, causing regular pneumatization with bladder shaped broadening of the terminal cells.

2. Hyperplastic mucosa: according to intensity of the process this causes (a) the sclerotic mastoid; (b) incompletely developed areas of pneumatization in the mastoid; (c) distinctly irregular pneumatization, more or less extensive; (d) small-celled, thick-walled pneumatization throughout.

3. Hypoplastic (fibrous) mucosa: according to its degree he finds (a) the sclerotic mastoid with retained diploetic spaces; (b) much reduced, sharply defined pneumatization with large tip cells; (c) moderately reduced pneumatization of nearly regular character.

4. Hyperplastic-fibrous mucosa: this is said to cause considerable reduction of pneumatization, which is irregular, with small thick-walled cells.

Wittmaack recommends roentgenologic study of the mastoid cells as a guide to the probable type of mucosa present. He relies upon the appearance of the tympanic membrane also, a thin atrophic drum indicating fibrous mucosal changes; while the dull, thickened, "scarred" membrane accompanies hyperplastic mucosa. Mucoid secretion indicates to him hyperplastic, thick epithelium; thick purulent discharge comes from moderate hyperplasia with low epithelium; thin fluid discharge indicates fibrous mucosa.

He has not yet decided whether regular determination of the mucosal type in a given middle ear will prove clinically worth while. He maintains that differences in the infective agent cannot alone explain the varying course of mastoid infection. Abortive forms suggest the fibrous mucosa. Purulent forms indicate moderate mucosal hyperplasia with irregular pneumatization. Long continued mucopurulent discharge with a tendency to chronicity points to the sclerosed mastoid with its corollary, strongly hyperplastic mucosa. Transition to chronicity does not depend upon the infective agent, for in such cases the original virulent germ is replaced by those of less virulence; but the typical anatomic basis for chronicity in-

cludes: sclerotic mastoid, thick hyperplastic mucosa, and open tube permitting transfer of coexistent nasal or pharyngeal infection.

Wittmaack considers that the streptococcus mucosus is most likely to attack remote cells in the periphery of the regularly pneumatized mastoid; hence its serious complications. Hemolytic streptococci, on the other hand, are generally found in the irregularly pneumatized, slightly hyperplastic large central cells. He denies that intracranial complications can be predicted, or that they can always be avoided by early operation. He is now attempting to explain such complications through his mucosal and pneumatization studies, so far without practical results. F.

The Treatment of Cancer of the Pharynx, Larynx and Esophagus by Surgical Diathermy.
Dr. Dan Mackenzie (London).

Dr. Mackenzie bases his excellent review largely on English practice, reporting a dozen typical cases. He favors radical removal of lymphatic glands, and advocates ligation of the external carotid in tonsillar and pharyngeal excisions. He avoids diathermy of laryngeal growths for fear of damage to the cartilage, but seals the excision wounds with the spark, as also after biopsy specimens are taken. He follows up recurrences with occasional diathermy treatments. He is convinced of the relatively bad outlook in cases with foul mouths or where teeth have just been removed, as against those whose teeth have long been gone. Many helpful and detailed technical suggestions are made.

Mackenzie finds radium preferable to diathermy in postcricoid and esophageal cancer and in sarcoma of the pharynx. The complete article will repay reading by those interested. F.

Diathermy Treatment of Malignant Tumors of the Nasal Accessory Sinuses and of the Naso- and Meso-pharynx. (Die Diathermiebehandlung der bösartigen Tumoren der Nasennebenhöhlen, des Naso- und Meso-pharynx.)
Prof. G. Holmgren (Stockholm).

An exhaustive historical review is followed by discussion of the development of present-day technic. Approving the general practice of ligation of the external carotid and of the lingual arteries where extensive resections are to be made in

these distributions, Holmgren nevertheless reports 73 total resections of the superior maxilla, including ethmoids and phenoids, often with the orbital contents, without fatal hemorrhage and with severe bleeding in but four cases. "Relatively few" of his cases had been previously ligated. Danger of bleeding comes two weeks postoperative; hence, to avoid lengthening the diatheramy operation ligation may be made one week later. Care must be taken to avoid vessels, nerves and the meninges, and depth of coagulation must be accurately gauged. He reports 13 recurrences, six months after 39 surgical resections of the upper jaw (33 per cent), and 21 recurrences after 64 diathermy resections (32 per cent); thus diathermy cannot be said to favor recurrences from circulatory stimulation at its periphery.

Most intranasal or sinus tumors are well developed before they are diagnosed. He sees 75 per cent carcinoma to 25 per cent sarcoma and other types. Twenty to thirty per cent come from the alveolar process with secondary antral involvement: 70 to 80 per cent are either primary in the antrum or grow into its cavity from the ethmoid or elsewhere. It is often hard to decide the point of origin. Frontal and sphenoidal carcinoma, unless secondary to the ethmoid, are rare.

Prof. Holmgren insists that sacrifice of external skin is rarely necessary. His incision is in the labiogingival fold, with the diathermy knife; then, after rapid surgical opening of the antral wall, he places one electrode within and one outside the cavity and coagulates the tumor mass and surrounding bone as completely and as rapidly as possible. The dried mass is curetted out when dry. Because of one fatal case, he now avoids coagulation up to the cribriform plate, and now resects the upper ethmoid region surgically, with radium implantation. Orbital exenteration is frequently done. During the operation the choanæ are plugged by a finger cot, and large mouth tampons and suction keep the pharynx clear.

The operation is long (one to one and a half hours), but its advantages lie in avoidance of any instrumentation of the tumor until coagulation, thus preventing tumor cell implantation and dissemination. Healing is slow, especially if bony sequestra have to separate. Removal of all bone possible at the primary operation is advised.

The wound is packed with a perforated, oiled rubber bag (old glove) filled with gauze. In this is placed any radium necessary —at most, 96 mgm., in four tubes—two in the ethmoid and sphenoid, two near the pterygoid process. Packing and radium are removed in twelve hours and not replaced. The patient is up part of each day the first week, but must keep quiet pending separation of the eschars during the second and third weeks. Careful local cleansing is needed; healing may require many weeks to several months. Recurrences are watched for and coagulated, after histologic examination.

The heavy scar and slight upward drawing of the lip are of little concern to the patient, and protheses are easily worn. The cavity should be left open one or two years for observation.

Holmgren does not attack cervical glands which do not show evidence of metastasis. Where the latter is slight he advises radium therapy, both by distance and with needles. If metastases are extensive, surgery or radium are alike worthless.

Prognostically he shares New's optimism and equals his percentages, having 28.7 per cent surviving out of a total of 80 cases, or 35.9 per cent of the 64 operable cases. His early work was insufficiently radical; but since 1924 he has an average of 43 per cent of survivals. Of four deaths postoperative, three were due to high coagulation in the upper ethmoid region; the fourth was an inhalation pneumonia.

He considers endothelioma least malignant, then sarcoma, then carcinoma. Prognosis is worst with ethmoid involvement, better with alveolar origin, and best in growths limited to the antrum. Distant extensions, to the orbit, pterygomaxillary fossa or dura, are very grave, as is glandular metastasis.

The prognosis in nasal and accessory sinus malignancy has markedly improved in the past ten years. Pure radiologic treatment (survivals 20 per cent) and pure surgical treatment (survivals 25 per cent) gave place to surgical resection plus radium. With this, survivals increased to 38 per cent (Hautant), 52 per cent (Barnes) and 33 per cent (Crosby Greene). Then came diathermy plus radium, with survivals of 36 per cent (New, carcinoma and sarcoma), and 35.9 per cent (Holmgren, carcinoma only). Postoperative mortality for surgery was 11 per cent (Hautant), 16 per cent (Barnes), and 11

per cent (Crosby Greene), as against 9 per cent (New) and 5.4 per cent (Holmgren) for diathermy.

Less shock, better cosmetic results and freedom from implantation compensate for greater length of operation and healing, postoperative stench and risk of bleeding. This work should be handled by the rhinologist, not the general surgeon.

Nasopharyngeal fibromata should all receive bipolar coagulation prior to surgical attack; if speed is not essential, radium can destroy these growths, but three years' treatment will be needed.

Holmgren limits use of diathermy in nasopharyngeal malignancy to palliation of large or ulcerated tumors, and to those not arrested by radium. The latter should be used immediately after such diathermy treatment.

Embodying the results of treatment at the Sabbatsberg and Radiumhemmet in Stockholm, where ample support is afforded by the King of Sweden and his government for this work, Professor Holmgren's contribution is clear and authoritative, with an extensive and accurate international bibliography. F.

Books Received

Diagnostic et Thérapeutique par le Lipiodol.

By J. A. Sicard and J. Forestier. Clinique et Radiologie, Paris. Paper. 8vo of 370 pages, profusely illustrated. Paris, Masson et Cie, 1928.

The names of Sicard and Forestier are inseparably attached to the development of iodized oil as a contrast medium in X-ray diagnosis. In this work they have approached the subject from all angles. There is a short introduction pertaining to the subject of fluid contrast media, but the work is essentially a description of their use in the various regions of the body.

While this book is primarily of interest to the radiologist, a large portion of it is devoted to the upper respiratory tract, and the bronchoscopist will do well to study it.

A translation into English is in preparation.

Sinus Thrombophlebitis.

By Alfred Braun, M. D., Attending Otolaryngologist, Hospital for Joint Diseases, New York. Cloth. 4to of 269 pages, with 111 illustrations. New York, Paul B. Hoeber, Inc., 1928. Price $12.00.

This is a comprehensive monograph on the subject, written for the internist and the pediatrist as well as the otologist. Particular stress is laid upon the causal relation between general systemic disease and middle ear suppuration.

"The writer has endeavored to draw the clinical picture of otogenic general sepsis as clearly and as sharply as it is possible to delineate a condition which has such protean manifestations. He has attempted to indicate the usual and some of the unusual forms which the disease may assume. He has tried to correlate the clinical picture with the underlying pathologic condition, and to formulate a rational treatment, based upon the anatomy and the pathologic changes in the tissues involved."

The illustrations are unusually lucid.

Erratum: Dr. T. J. Williams, whose address was erroneously given as Edinburgh in the September issue of the ANNALS, is a resident of Chicago.

SOCIETY MEETINGS.

The Pacific Coast Oto-Ophthalmological Society will hold its next annual meeting in Salt Lake City, Monday, Tuesday and Wednesday, the first, second and third of July, 1929.

The annual meeting of the American Laryngological, Rhinological and Otological Society, Inc., will be held in San Francisco, July fourth, fifth and sixth, 1929.

Society Proceedings

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY.

Regular Meeting, Held on Monday, April 2, 1928.

DR. JOSEPH C. BECK, PRESIDING.

DISCUSSION OF CASES PRESENTED.

DR. JOSEPH C. BECK said that of the three cases he presented, the first patient was a woman, aged 23, whom he first saw sixteen years ago. At that time she had an acute exacerbation of a chronic otitis media, with subacute mastoiditis and cholesteatoma. The condition required immediate operation, and with the assistance of Dr. William Ballinger a Heath operation was performed on one side and a radical mastoid operation on the other.

This patient was now presented to demonstrate the effects of the treatment. She could hear the whispered voice at a distance of twenty feet and the high tones with the audiogram were preserved. This was one of the few cases in which the Heath operation had given permanently successful results. The case was interesting also because ether anesthesia was used and the patient developed an infective bronchitis which still persisted. She remained in fairly good condition, but once a day expectorated quite a large amount of material which looked like pus.

The second case was one of carcinoma of the antrum, which was relieved by electrocoagulation. The growth was the size of an apple, under the zygoma and under the eye. Histologic examination proved the growth to be carcinoma. The entire lower floor of the orbit was removed, leaving the eye, and vision was now good. The lateral wall of the antrum, into the zygomatic area was removed, and the entire front of the face, including the skin, was left wide open. The operation was performed in November, 1927, and tissue had been removed

at monthly intervals since that time for examination. There had been no sign of recurrence to date. A violent erysipelas developed about six weeks before presentation, and her attending physician gave her a serum which influenced the local condition somewhat, and the general condition was markedly improved.

The third case was a mixed tumor of the pharynx which appeared to rise from the styloid process. It appeared a few weeks after a tonsillectomy was performed, one and a half years ago, filling the right half of the palate and anterior wall of the pillar, involving more than half of the pharynx. Histologic examination proved it to be a myxofibrosarcoma. This tumor was shelled out completely from the capsule and removed in pieces, following which the cavity was filled with gauze and the incision in the median raphe of the pillar was closed. Within two weeks the growth began to recur and at this time, two months after the operation, was as large and as hard as before any operative interference.

On looking up the literature, Dr. Beck had found a report of eight cases of tumors of the palate similar to this one. He believed that if he had removed the capsule of the tumor there would have been no recurrence. It would have been difficult to dissect it out, but in future he intended to make an attempt to destroy the capsule in such cases with an electric button, making the incision externally instead of in the median line. The patient's voice was good, which was important, as he was an attorney. The growth was not malignant, except insofar as it pressed on nerves and other vital structures.

Dr. Robert Sonnenschein reported the case of a man, aged 30, who was seen four months previously, with a large, firm, round, smooth swelling in the soft palate on the right side. The history stated that he had first noticed the increase in size, which was unaccompanied by pain, that he then had difficulty in swallowing and a marked change in voice. Under local anesthesia an incision was made through the mucosa, and the tumor, intact in its capsule, was shelled out. It was smooth, except for one or two rounded protuberances such as are seen in uterine fibroids. The wound was lightly packed and sutured, and the patient made an uneventful recovery. When seen

three months later there was no sign of a recurrence. Histologic examination showed the growth to be a mixed tumor.

DISCUSSION.

DR. GEORGE W. BOOT said he had recently operated on a case of carcinoma of the antrum, which occurred in a woman and was accompanied by intense pain. An incision was made from the outer part of the orbit through the nose and upper lip, the entire flap turned back, the common carotid ligated and everything destroyed. Everything was removed from the midline of the hard and soft palates, including the floor of the orbit. The patient still had a voice that could be understood.

In regard to tumors of the pharynx, Dr. Boot stated that about four months ago he had operated on such a tumor, which was as large as a thumb and extended from the level of the larynx to the base of the skull. He had great difficulty in shelling it out because it extended so high up, and he used his finger for this purpose for fear of tearing the internal carotid or some other large vessel. The tumor resembled a dermoid cyst and had a definite capsule. The result obtained was quite satisfactory, and the throat did not look any worse than following many tonsillectomies.

DR. JOSEPH C. BECK asked Dr. Boot whether he had any cerebral or motor affection following the ligation of the common carotid. Also, whether he left the skin in the case of carcinoma.

He thought that even with a hole in the palate it was not easy to say whether or not there was any recurrence. In the case he showed, the patient had a large hole in the face, but as soon as he was convinced that there was no recurrence a prosthesis would be prepared for her, although he would not do any plastic work.

DR. BOOT, replying to Dr. Beck, said that he ligated the common carotid because he expected severe hemorrhage from the internal carotid, and because the tumor extended so far back on the wall. This step was taken to obviate hemorrhage, and there was no trouble at all following the ligation.

In the other case the skin was not involved and he saw no reason why it should not be left to cover the area.

SCIENTIFIC PROGRAM.

DR. EDWIN MCGINNIS addressed the society on "Some Observations in Bronchoscopy," with lantern slide demonstration.

(Author's Abstract.)

Twenty years of experience with foreign body cases have brought me nearly all the types of cases for observation, and also about all the complications which can ensue. The ball-bearing cases have been instructive, as well as difficult of cure. A ball bearing is easy to demonstrate with the X-ray, and also easy to see at the end of the bronchoscope, but it is very difficult to get a firm and efficient grasp on it on account of its smooth spherical surface. This problem was easily solved after I had a simple grasping forceps of peculiar power made for use in such cases.

Another case of interest was that of an eight-year-old boy who had inspired a piece of chicken bone. Crowing respirations and husky voice were the prominent symptoms. Direct examination revealed a piece of chicken scapula wedged into the trachea about two inches below the larynx. Left vocal cord was cut at about the middle by the passage of the bone. It took quite a little teasing and manipulation to get the bone through the larynx, but this was finally accomplished without further damage to the vocal cords. For one week after the operation, the voice was very husky. Then he went through a period of lost voice, and finally, one month later, could only make audible, squeaky sounds with great effort. Examination one month later revealed posterior portions of both cords flabby and a web formation present in anterior commissure.

Two months after the operation the boy returned to the hospital for further observation. Under general anesthesia and suspension, the web was removed and the edges of the cords smoothed off. Since then there has been a steady improvement in the voice.

Twenty years ago Dr. E. Fletcher Ingals was using general anesthesia in his endoscopic cases. Great difficulty was encountered because of the bronchial secretions obscuring the vision. Cotton and gauze swabs were employed by him to keep the bronchi and tube clear. Atropin was used to help dry up the secretion. I well remember his last case of general anesthesia,

because the patient died on the table. After this he employed local anesthesias, as did Chevalier Jackson.

With the perfection of the mechanical suction pump of Beck-Mueller, the difficulty of secretion removal is eliminated; so that now in certain cases the complete relaxation and elimination of anxiety can be safely accomplished by a general anesthetic.

I have gotten a great deal of satisfaction out of eight cases of foreign body extraction under ether anesthesia. Such ease of accomplishment, with very little after shock to the individual, has been very gratifying.

Lastly, I did a bronchoscopic examination, aspiration and topical application upon an asthmatic individual under ethylene anesthesia. This was safely and easily accomplished, and the patient waked up very promptly at the completion of the procedure.

DISCUSSION.

DR. GEORGE W. BOOT said he never had experienced any particular trouble as the result of an anesthetic, and has used ether except in very small children. It has sometimes been difficult to decide whether or not to give an anesthetic. In one case the child had inhaled the rubber end of a lead pencil, and it was necessary to give a light ether anesthetic in order to get hold of this subject and extract it.

He thought a corkscrew on the end of a piece of piano wire made a good instrument for removing ball bearings. He has used this a number of times in removing round objects and it has worked well.

Everyone encountered fistulas if they did bronchoscopies. He has had three or four deaths among patients who have swallowed open safety pins, and felt that an open safety pin in the esophagus is as dangerous a foreign body as the patient can swallow. Another patient died as the result of inhaling a peanut. Several cases were cited in which the patient had marked tracheitis. One child, aged 4, who had diabetes, had been on insulin for some time when it developed a marked obstruction and it was necessary to do a tracheotomy. For several days afterward he had to do bronchoscopy several times daily to remove crusts that formed in the trachea.

An infant seen recently died because his advice was not followed. At times this child could breathe normally and then apparently could get no air at all. Dr. Boot advised a tracheotomy, but the attending pediatrician said he had seen many similar cases recover without this and it was not done. The following night the child died. It appeared to have paralysis of the adductors and a flabby epiglottis. The postmortem showed no sign of cerebral birth hemorrhage.

Dr. Boot believed that many of the notches in the vocal cords smooth out in the course of time.

Dr. Arthur M. Corwin, referring to paralysis of the adductors in cords fixed in the median line, with stridor, recalled a case seen some years ago in a young man who had had a thyroidectomy, with a resulting bilateral adductor paralysis. It was necessary to do something, so by means of the indirect method and punch forceps with a lateral bite, a piece was removed from each cord, leaving a round hole in the middle of the glottis, which relieved the difficulty. The voice was temporarily gone, but after the wound healed in a healthy way there was normal breathing and the voice returned to a remarkable degree, even though the wall of both cords was punched out to the lateral margin. He believed that in all cases of bilateral adductor paralysis the punching out of a good sized piece of the middle of the cord is advisable. This is, of course, not a new procedure but one too often overlooked.

Dr. Robert Sonnenschein said, referring to the toxicity of cocain, that Dr. Ross had pointed out in his thesis that when cocain and adrenalin are used together the rise in the intracranial venous pressure is much greater than the combined pressure would be if used separately. Therefore, the danger is greater from using the combination than if one used the adrenalin and waited four to five minutes until the blood pressure rise had subsided before applying the cocain.

Dr. Joseph C. Beck, discussing bilateral paralysis of the adductors, said he had seen quite a good deal in his experience, usually following complete thyroidectomies. It is not so frequent now, but still occurs as the result of thyroiditis. The bulbar paralysis is the most frequent, and as the result of the toxic condition the ascending paralysis occurs. Tumors in the

esophagus are responsible in some cases. He cited the case of a woman, aged 65, who was under observation because of cancer of the esophagus, which was diagnosed at the Mayo Clinic. The growth was of the squamous cell type, and the patient was given large doses of X-ray radiation, with the result that she could eat practically nothing. Within two weeks, however, she could swallow quantities of milk, water and soft food without difficulty, and was greatly improved for about a month when obstruction recurred. It was impossible to get a filiform through the mass and a gastrostomy was performed, from which she recovered, only to develop abductor paralysis, which became complete within a week and tracheotomy had to be done.

Referring to Dr. Corwin's remarks, Dr. Beck stated that the operation he described had been discarded because the results were not good. In their work they do a Killian laryngostomy, splitting the larynx and holding it open until it will remain so, when a plastic operation is done. He thought Frazier had added much to this field by his work in neurosurgery. In the abductory paralysis occurring in children he thought one should keep the question of thyroiditis in mind.

Dr. Boot called attention to an article which appeared in the Annals of Otology, Rhinology and Laryngology, a year or so ago, in which several cases of this sort were reported, and in all of them it was found that the children had suffered from cerebral birth palsy.

Dr. McGinnis, closing, said he had tried the removing of both cords in abductor paralysis before Frazier brought out his operation, and found that the arytenoids pulled out lateral bands, and the same condition, namely, respiratory obstruction, gradually returned. He thought it would be a good idea to try getting one superior laryngeal nerve, and if this worked to cut the other.

Referring to Dr. Good's remarks, he said his patient had such a pronounced ankylosis of the neck that it was impossible to expose the larynx. He believed that many cases of this type would be found in which it would be impossible to get extension even under a general anesthetic.

SOME REMARKS ON THE AUDITOR AND THEORIES OF HEARING.

DR. J. GORDON WILSON said that his experience with the auditor had been disappointing. Some patients claimed they could hear better, but on testing with tuning forks no improvement could be demonstrated. One exception was the case of a young man who had improved so much that he was going to get an auditor and continue with its use.

As to resonance, it is claimed that there are two places where this can take place, one in the tectorial membrane and the other in the basilar. The tectorial membrane consists of a jelly-like substance, and no one has ever demonstrated resonance in such a substance. In the basilar membrane the fibers are arranged in different ways, with the fibers a little longer in some places than in others, but from the physical standpoint these fibers are not sufficient to account for the difference in selectivity. It has been shown, however, that there is in the cochlea a sufficient amount of tension to pull these fibers over.

If there are two physical mechanisms, how can one account for the fact that they are always in tune? This brings up the question of diplacusis, which is another difficulty.

The last difficulty is the "all or nothing" theory applied to hearing. If a nerve fiber is stimulated it is stimulated for its whole force or nothing at all. No nerve fiber can give sufficient amplitude to give different amplitudes of hearing. If a nerve fiber is stimulated it gives one response and one only. He no longer believed that only one fiber is stimulated, but a number, and the fiber that gives the result is the fiber at the apex, which might account for the difference in pitch. In the "all or nothing" theory there would appear to be only one amplitude possible. Knudson says that there are usually associated nerve fibers, and in order to account for the amplitude he obtains he has to get ten fibers, but this is difficult to understand.

Dr. Dandy has recently removed a whole half hemisphere, and on one occasion the entire temporal lobe, from a patient and he heard as well afterward as before. This appears to disprove the theory that the hearing is located bilaterally in the temporal lobe.

Dr. Wilson knew of no theory that would completely satisfy any theory of hearing.

DISCUSSION.

DR. SAMUEL SALINGER was reluctant to discuss the auditor because he had not conducted sufficient experiments to permit of definite conclusions. A machine was installed in the Cook County Hospital in the summer of 1927, and they attempted to run a series of cases. It required a great deal of time to do this satisfactorily, but enough of the patients persisted so that they had a series of thirty-odd patients, who received treatments regularly over two or three months. The results were very disappointing. He could not recall a single case in which the tests could demonstrate any improvement, and in some instances he found a distinct loss for certain words or numbers. The instrument had no influence on hearing, as determined by tuning forks or the Galton whistle.

He had deferred making any formal report until he could persuade more patients to continue the treatment, but he hoped within a few months to be able to offer something definite. He could not understand how the machine could influence the hearing, although it was supposed that the to-and-fro motion of the cap-shaped piece of metal produces vibrations in the atmosphere which increase the hearing, working on the principle that the vibrations in the surrounding atmosphere are overcoming the conducting apparatus.

Dr. Salinger did not feel that any new method of treatment should be condemned until it had a fair trial, but thought anyone who was going to use this instrument should do so under proper regulations, so far as testing the hearing is concerned. It is impossible to base any deductions on the statements of the patients because of the psychologic effect of any new treatment.

DR. ROBERT SONNENSCHEIN said his attention had been called to an article in the Literary Digent, about two years ago, in which this instrument was described for the first time. He had seen the instrument only once and had no experience with its use. The theory that the production of tones of great amplitude would mask the low tones produced by the voice, and thereby allow the deaf to hear better, seemed to him rather

strange. Tröltsch, in his textbook, stated that the reason patients with paracusis hear better in the presence of noise is because the persons talking to them speak louder at such times. The reason ascribed to the fact that apparently such persons hear better on trains is because the vibrations work upon the foot-plate; but experiments have shown that it is probably because the low tones to which they are deaf do not disturb them, but they do disturb the individual with good hearing who is talking to the deafened one. The hearing individual who is disturbed by the noise speaks much louder, so the deaf person thus hears much better. When an intense tone of low pitch is produced the person hears the high tones better for the time being, on the theory that if the drum membrane is in an unfavorable position the low tones of great amplitude carry the drum membrane to a better position and the high tones are heard better.

Dr. Sonnenschein was glad Dr. Salinger had taken the trouble to investigate the machine, for unless a new apparatus is tested properly the manufacturers so favorably influence the profession that many individuals put such an apparatus in their office and use it on all patients, regardless of the pathology that is present.

Dr. Otto Stein stated that his attention was directed to the auditor two years ago, and he was sufficiently interested in it to offer to make a few experiments, to determine whether or not it had any value. He stipulated that the apparatus be placed in his clinic at the Postgraduate Hospital, and that he would test the cases before they were treated, as the manufacturer wished them to be treated, and again afterward. This was done and they secured actual records of sixty cases treated in this manner. After comparing notes it was found that not more than half a dozen of the patients showed any improvement in the whispered voice test. Immediately after this treatment the patients were treated by the usual methods—inflation, massage and so on, and in most instances they were able to show a substantial increase in hearing after the usual methods were employed. After six months he requested that the apparatus be removed.

Dr. George W. Boot, referring to the resonating structure in the ear that Shambaugh definitely proved was not the ba-

silar membrane, said that no one had proven that because the tectorial membrane is jelly-like it cannot vibrate. Anyone who has eaten jelly knows that it can vibrate. He thought it was well known that many abscesses cause loss of hearing, and stated that Bassoe had reported a case in which only one hemisphere was present, and yet the patient had the use of both sides of the body. Dr. Boot had one patient who said he could hear a pin drop in a boiler shop. Another patient claimed that she could hear perfectly when a piano was being played. He had placed a noisy suction apparatus on the table by the patient, and the patient could hear plainly when this was in operation but could not hear when this was turned off. This was also true of tuning fork tests. There certainly could be no increase in intensity of the vibrating fork when the noise stopped.

Dr. Joseph C. Beck said that two years ago he requested Dr. Ira Frank to accompany him to the place where the auditor was made, but he did not become enthused sufficiently to have one placed in their clinic. They had one very noisy machine which was of no value. He thought the profession should try anything that would be of assistance to deafened individuals, but that investigations must be very carefully controlled. Recently a scientist from Prague had published an article on the use of arsenic in the treatment of deafness, which seemed so promising that they tried it on several patients, but not in one single instance had improvement been noted.

Contributors to This Number

Those members of the American Board of Otolaryngology who have contributed the symposium upon the Board's work, to be found on the opening pages of this issue, require no introduction. The opening article indicates the manner in which the members of the Board were chosen, and their geographic distribution is typified by that of these six contributors: HARRIS P. MOSHER, President of the Board, is Professor of Laryngology at Harvard University; ROSS HALL SKILLERN is Professor of Laryngology in the University of Pennsylvania Graduate School of Medicine; ROBERT C. LYNCH is Professor of Otolaryngology at Tulane University; JOSEPH C. BECK is Associate Professor of Otolaryngology at the University of Illinois College of Medicine; RALPH A. FENTON is Clinical Professor in the Department of Ophthalmology and Laryngology, at the University of Oregon; WILLIAM P. WHERRY, Secretary of the Board—and of the Academy as well—is Instructor in Laryngology and Rhinology at the University of Nebraska.

THOMAS J. HARRIS, Consulting Surgeon and late Professor of Laryngology at the New York Post-Graduate Medical School and Hospital, has long been a potent force in the destinies of American otolaryngology. He is Secretary-Treasurer of the American Otological Society, he was recently appointed to the American Board of Otolaryngology, and, with Arthur B. Duel, officially represented the American otolaryngological bodies at the International Congress of Otolaryngology at Copenhagen during the past summer. He contributes the article *"Acute Accessory Sinusitis and Its Management"* in this issue.

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the Journal of the Florida Medical Association, the Journal of the American Medical Association and other publications.

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SAMUEL SKILLERN, JR., is Assistant Professor of Laryngology in the Graduate School at the University of Pennsylvania. He is the author of numerous otolaryngologic publications, including a critical comparison of the modified Lothrop operation and the Killian procedure in chronic frontal sinusitis, read before the last annual meeting of the Academy in St. Louis.

H. H. BRIGGS of Asheville, North Carolina, is the author of numerous articles on ophthalmologic and laryngologic subjects. His first contribution to the ANNALS, *"Evolution of the Human Face,"* appears in this issue.

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